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EDITORIAL NOTES.

On Rationality in Measurement.

IT was recently remarked in a "JOURNAL" note, that the hopeless unintelligibility of the units of electric measurement, like the absence of practical basis in the case of the metric system, is a great drawback to the popularity of such systems. It is beginning to be understood that the common-sense ideas of number, quantity, and measurement inherited by the English-speaking race from a time anterior to the laying out of Stonehenge, are more deserving of respect than the soulless intellectualism of the past century, which produced the metric system and all its brood. If "science "is measurement"—and the aphorism is sound—then it is equally scientific that the units of measurement should be intelligible and be intelligibly treated. The late Professor Rankine was almost alone in his day in standing out against the metric system, that fine flower of French pedantry which during the rule of the utilitarian sentimentalism of the middle-Victorian epoch had a better chance than it ever will have again of swamping British common-sense measures. It produced later the centimetre-gramme-second—portentous triplet!—with which modern physical science has been so sorely oppressed. It was reserved for the modern race of electric light sellers, however, to experience the full rigour of that logically-derived system of measurement which insists on rating everything that has magnitude in terms of an imaginary portion of an arc of the earth's longitude (erroneous). Gas engineers should be thankful every hour of the working day that they and their customers have to do with commodities sold by the foot and the ton, which everybody understands, and not with something which is a mere mathematical expression.

People are very fond of acclaiming the pre-eminence of the American electrical industries. It would astonish many of those who thus profess to admire without knowledge of the subject, to be told that the much-advertised popularity of electric lighting in the United States has been attained on the primitive rental system of charging. Electricity meters are beginning to spread in the United States; but they are not popular, nor regarded as necessary to the business. The leading technical journal published in America unaffectedly regrets the new fashion, and predicts further complications over consumers' bills, instead of greater simplicity and ease of work in the office, as the result of the change. It is remarked, truly enough, that the consumer does not know a volt from an ampere; and when he is sold current in kilowatt-hours, his confusion is doubly confounded. "He "can understand a contract rate of so much per lamp per "annum, or per quarter, and, moreover, he is prepared to "pay by meter when he can grasp the unit system on which "he is charged." But when the whole thing is a blank, what is the consumer to do if he should happen to fancy himself overcharged? That there is not complete agreement among electricians on this subject of charging for electricity, even in England, is evident from the excited controversy that has raged among them over Mr. Wright's latest paper on the "maximum demand" system. If the consumers were equally vocal, there would be a tremendous outcry over the matter.

Meanwhile, it is interesting to note that the ground of these very scientific systems of measurement, including the electrical, is being exploded from under them by certain iconoclastic philosophers, who boldly declare that the multiplication and division of numbers relating to different things makes nonsense. A linear foot, a square foot, and eke a cubic foot, is a rational entity. Multiply one cubic foot by a thousand, and you get a thousand cubic feet, which is the way we sell gas. If any man doubts it, we can draw off a cubic foot of gas into a bottle through his meter, and show him that the index truly registers the passage of this quantity. But a measure of electricity is something computed out of time, and pressure, and resistance. Hereupon Dr. Frederick Hovenden writes to the "Pall Mall Gazette" to say that one can no more multiply a foot into a pound, and also into so many seconds, than one can multiply a Dutch cheese into a rasher of bacon. The product is an unreality in either case. "Conceive a man of business taking his "stock by multiplying 10 cheeses into 10 sides of bacon to "produce 100, and then multiplying this by 10 yards of "sausages to produce 1000, and so on, until he finds he is "in possession of 1478320183204, or some such numerical "value." Yet this is the way "units" are compounded. Why not reckon in units of "appetite-destroying power," as well as in units of electricity? The multiplication of eggs and cheeses into bacon would produce "units" of food.

Cheaper Coal in Prospect.

THE approach of the time when many annual coal contracts are usually concluded is naturally causing both buyers and sellers to attempt a forecast of the future, as the all-important question of price is still an open one. Fortunately, buyers can view the situation with more confidence and patience than can the other parties to the yet unconcluded bargain. Prices will not be higher than those ruling under current contracts. That can be said with certainty. They should be, and we believe will be, lower. The coal owners think so too, or they would not, when business was brisk at the end of last year, have accepted from the railway companies, for their requirements this half year, prices slightly under those at which the companies bought at the end of March last, when coal was at its lowest for the year. The railways are paying now about 8s. 9d. per ton, against 9s. in the last three quarters of 1901, and 16s. during the second half of 1900. Present contracts, moreover, only run to June; and the companies ought to get better terms then.

Certainly, gas undertakings coming into the market this spring for a year's requirements ought to get more than 3d. per ton reduction upon the past year's figures, which were a good half-crown above bottom prices. To attempt to get prices cut down to that level straight away would, possibly, precipitate labour troubles, seeing that in the Federation district wages are still at maximum rates; but there is no reason why a good step down towards the bottom should not be taken. Wages must be reduced before long; and it is scarcely probable that the men would forcibly resist a drop to the rates midway between maximum and minimum which were current during the first nine months of 1900. If there were a likelihood of the men refusing to accept, to the extent of striking against, such a reduction, we should say let the fight come first rather than last; for all this time the Federation is piling up its bank balance. A sign of the times is afforded by the statement that the Yorkshire miners have decided to double their weekly subscriptions, and to increase the rate of strike pay by 66 per cent.

A careful consideration of all the factors governing the coal market discovers for us no reason for anticipating anything but a fall. The export trade is likely, after the first quarter of the year, to show a decrease, as such effect as the tax may have will be much more apparent then than it was in the past year. The Continent is now in a very different position in regard to coal supply from that in which it was two years ago; and the still above-ordinary price of British coal lays the market open to competition, and induces increased home production (as in the case of Russia), sufficiently to check in some measure our exports. The iron trade in Germany is recovering slightly, though it is too soon to say permanently, from its recent acute depression; but the present actual output of coal in Westphalia is so much lower than the possible, that any increased demand in the German market can easily be met without recourse to further imports.

It is, of course, not in the export trade alone that the continued dearness of coal makes itself felt. Coal has been so much higher in price in comparatively recent times than it is now, that some people—especially the colliery proprietors and the miners—seem to forget that it is still dear. Yet the iron trade is obviously handicapped materially in fighting foreign competition, by the fact that coal is quite 2s. a

ton above the normal level. That means (say) 4s. per ton on pig iron, 6s. per ton on steel bars, 8s. to 10s. per ton on steel plates, and still more on machinery and finished goods. The result is that iron and steel manufacturers cannot possibly reduce their prices to a level at which orders would be freely given by customers who have been buying as little as possible—from hand to mouth—for the past year or two, and who will continue so to buy until the producers can meet them with more tempting offers. In the meantime, the country is inundated with cheap iron from Belgium and Germany, and the manufacturers are beginning to cry for protection—in order, we suppose, that the men in the iron trades may go on curtailing output and increasing the cost of production, at the expense of the consumer, and that the coal miner may continue to do a poor day's work at a high rate of pay per ton. High prices, too, will, with low freights, inevitably considerably reduce the recent enormous volume of shipbuilding. Last year saw a record tonnage of vessels turned out of our shipbuilding yards; and the end of the year saw a record number of vessels (forty) laid up in the Tyne for want of remunerative freights. So that, though the yards have a lot of work on hand, new orders are conspicuously absent; and the second half of the year will see slack times there, which means less business for the iron and steel makers.

The following comparison of market quotations—not to be confounded with the prices at which long contracts, or indeed immediate purchases in many cases, can be made—may usefully be added in conclusion. The prices given are those quoted (*a*) at this time last year; (*b*) in the middle of December; and (*c*) at the end of last week. Best Cardiff Steam Coal: (*a*) 20s. 6d., (*b*) 16s. 9d., and (*c*) 15s. 6d. Best Durham Gas Coal: (*a*) 12s. 6d., (*b*) 12s. 9d., and (*c*) 11s. Splint Coal, Lancashire: (*a*) 12s., (*b*) 11s. 6d., and (*c*) 11s. 3d. "There is a noticeable absence of forward con-"tracts." We are glad to hear it, and hope that gas coal buyers will show no disposition to hurry matters.

The London County Council and Burners for 14-Candle Gas.

An indication of the spirit and the knowledge with which that cynosure of all local authorities, the London County Council, approaches gas questions was furnished at last Tuesday's meeting of that body. On this occasion, the Public Control Committee submitted a report on a point which has arisen in connection with the reduction of the standard illuminating power of the gas supplied by the South Metropolitan Company. Under the provisions of the Company's Act of 1900, which sanctions the change, the Company are to supply gratis, on application, burners suitable for consuming the gas of reduced illuminating power. It has pleased the Committee of the Council to imagine that they are the judges of what is a suitable burner in the circumstances; and they very sensibly consider a governor burner better than one which is not provided with this accessory. They have referred the question to their Chemist and Superintending Gas Examiner, who reported that, whereas a good governor burner will keep the consumption of gas down to the rated capacity of the burner, irrespective of the higher pressure in the pipes at night, an ungoverned burner can be made to flare away nearly double its nominal consumption by putting 3 inches of pressure behind it. Prodigious! To do the Public Control Committee justice, their report to the Council did not attempt to pin the Council to a definite course of action, but was rather of the nature of an interim pronouncement. As though to show the danger of stirring up these matters to no good purpose, Mr. Leon, a member of the Council not on the Committee, moved to refer the report back, which was done.

Once more the Council listened to the voice of ignorance and misrepresentation, in preference to that of their own Committee, who might be presumed to know something of the subject. This Mr. Leon, whoever he is, said that Parliament had made the Company give the consumers new burners suitable for 14-candle gas, because, as the Company were about to save £100,000 a year, the consumers should not be put to the cost of providing a new burner to help the Company do it. And that is the way London is administered! Evidently this member of the London County Council never heard of the sliding-scale, and has no knowledge of any of the matters on which he orated so freely. Only make out that a gas or a water company is acting like a rogue, and the London County Council will jump at the idea. Mr. Leon wants the Council to go to law with the South Metropolitan Company to test the question of what is a suitable burner; and he wishes the Council to fix the obligation to supply and fix gratis governor burners, as a condition of the Commercial Bill of this year. And what is a governor burner by Act of Parliament? An argand or an incandescent burner is more suitable for consuming 14-candle gas than any flat-flame burner, governed or otherwise. Why not insist on a free distribution of these, while the Committee are about it? It is not for us to dogmatize on the subject; but if the London County Council propose to spend public money on a test case of this kind, there are several definitions of terms to be looked into before such an issue can be determined.

Wharncliffe Meeting of the Commercial Company.

The Commercial Gas Company held a Wharncliffe meeting last Thursday, with the object of procuring the consent of the proprietors to the Bill which is being promoted in the present session of Parliament. The Chairman of the Company, Mr. Bradshaw, presided, and explained the leading provisions of the Bill in a remarkably lucid and succinct statement. It is unnecessary to repeat their nature here, as the Bill has already been summarized. Mr. Bradshaw treated the legislative programme of the Board in so interesting a style, and the expediency of the promotion of such a reform of the statutory obligations of the Company is so obvious, that no suspicion of opposition from within the circle of the proprietary was to have been expected. It is, however, the unexpected which happens; and on this occasion the meeting was put to the trouble of a poll through a pedantic objection raised by a shareholder to the form of words relating to the exchange of new stock certificates for the old ones. We believe we are perfectly correct in stating that the punctilious one did not give himself the trouble to vote for his own cause, such as it was. It is not often that shareholders sitting on the public side of the Board table at gas companies' meetings press a point against the Chairman's formal motion for the adoption of an executive resolution; and when they do, as now, it is almost invariably on some trifling detail. The reflection is not flattering to the system; but the truth of it makes the responsibility of directors all the greater. There can be no real question of the competence and good faith of the Commercial Board, and it is no disparagement to the sufficiency of their Bill that it was criticized on so trivial a ground. Indeed, the argument is the other way; for if the objection raised is all that a captious critic—soured, as he confessed, by being charged the humble official shilling for a copy—could find to divide the meeting upon, there cannot be much amiss with the Bill as drafted from any point of view that a proprietor could conceivably occupy. It is quite true that in all companies' Bills there are a number of what may be characterized as "police" provisions, which are never intended to be put in force under normal conditions. After all, the question for those affected by a project of law of such a class is mainly as to who is to apply it. One does not insist on muzzling one's own dog indoors.

More Agitation against the Gaslight and Coke Company.

Abstention from Parliament this year is not to be allowed by the Metropolitan Local Authorities as a sufficient reason why the administration of the Gaslight and Coke Company should escape public criticism. The *agenda* paper of the London County Council for to-day contains some acidulated remarks on the Company, and a proposal for another conference of local authorities for the district supplied by this much-abused undertaking. Not even the sacrifices made by the Administration, revealed by the dividend announcement, which showed that an undivided balance amounting to £231,920 has disappeared since June, 1900, has served to assuage the animosity of the County Council. In all probability, the suggestion will prevail, and a conference will be held; but what will come of it all is another question. The Company have reduced their selling price as from the 1st inst., according to promise; but, of course, it still stands at the fatal figure of 9d. (corrected to 7d. by way of allowing for the difference of illuminating power) above that of the South Metropolitan Company, which prevails in the Southern District of the old London Company and for all public lights. This latter consideration

does not mollify the northern municipal corporations in the least. The situation is very strained; and he will be a great man who shall find a key to it. The circumstance of the London County Council having a small quarrel with the South Metropolitan Company on their hands—as discussed in another paragraph—does not reconcile them with the Horseferry Road. What can a public conference do that has not already been done? The Board of Trade can be appealed to with the familiar plea to "do something" to relieve the gas consumers of northern London; but in the absence of any legislative opening, it is vain to think that the Department can move. So long as the Company keep out of Parliament they cannot be touched. Meanwhile, the chief need is that all the parties concerned should keep a firm hold of the truth, and not permit prejudices or illusions to blind their vision of the facts as they are. The problem will be found quite difficult enough to solve, even when the factors are accepted. The County Council might materially help the municipal authorities by directing their Comptroller to prepare an exhaustive statement of the finances of the London Gas Companies since the settlement of 1875-6.

Lower Quality Gas for Southport.

At Southport, last Wednesday, a Local Government Board inquiry was held into an application by the Corporation for a Provisional Order to enable the illuminating power and the maximum price of the gas supplied by the Corporation to be reduced. The present standard of 20 candles was fixed by the Southport Improvement Act of 1871; and the requirement has had to be adhered to more scrupulously than is usually the case with municipalized gas supplies, because Southport provides gas for Birkdale. The two Local Authorities chiefly concerned agreed upon the terms of the new arrangement; and the only opposition came from local consumers. The case for the reduction was well sustained by Professor Vivian B. Lewes and Mr. Corbet Woodall; and the inquiry closed. Though, in accordance with the practice in these matters, no decision was given on the spot, there is not much reason to suppose that the Local Government Board will put any obstacle in the way of the improvement desired by the Southport Corporation. As the Town Clerk (Mr. J. E. Jarratt) well said, in explanation of the application, 20-candle gas was all very well thirty years ago, when there was no gas cooking, no gas-engine, and no incandescent gas-burner; but it is obsolete to-day. Besides, the difficulty of making 20-candle gas is now great, and it is increasing. Practically, nothing else but carburetted water gas can be relied upon to make it regularly at anything like a reasonable cost. It is to be feared that a decision favourable to the alteration, in the case of Southport, will prove a further discouragement to the cannel coal proprietors of the neighbouring fields. There is a good deal of cannel coal yet to be obtained in Lancashire; and this deposit has been regarded as an asset of considerable value by those to whom it belongs. It is valuable still, of course; but there is a difference. The days of cannel gas are numbered in the land; and those who are in any way interested in the prospect of a change of ideas in regard to the value of a high nominal illuminating power for common gas will be well advised to prepare accordingly.

Wholesome Reading for Workmen.

Reference has on several occasions been made in our columns to the series of articles on "The Crisis in British "Industry" which have been appearing in "The Times." Two suggestions have been made that the articles should be reprinted in pamphlet form for distribution, by employers and others, among workmen—one emanating from Mr. G. Livesey, and the other from Mr. W. Collison, the General Secretary of the National Free Labour Association. Mr. Livesey has promised to gladly do his part in the circulation of the pamphlet, which he suggests might be placed in all libraries and reading-rooms. Mr. Collison says that his Council trust the reprint will be made, "in order that the "sound social and economic views expressed therein may "be brought fully and completely to the notice of the great "mass of non-Union toilers, by whom they will be appre-"ciated, and are so well calculated to benefit from a social "and industrial point of view." We cordially support the suggestion, which we hope will be carried out. It will provide working men with reading matter of a far higher, and infinitely more useful, character than that furnished in the collection of snippets constituting the "ha'penny daily," or even in the average "weekly," with the more or less spicy contents of which they are too often in the habit of beguiling the hours of their rest-day.

The Welsbach Directorate.

The Directors of the Welsbach Company, after an opportunity for serious consideration (which the heated and agitated atmosphere of the meeting-room at the Cannon Street Hotel on the 15th inst. did not allow them to have), have come to the conclusion that the best thing for them to do is to resign. Voluntary or compulsory retirement would have had to come about sooner or later; and by complying without much delay with the common desire of the shareholders, they have taken the most dignified course open to them. The announcement of their relinquishment of office states: "Terms have been arranged whereby the members "of the old Board have resigned their position as Directors; "and the following members of the Advisory Committee, "the Hon. Philip Stanhope, Thomas James Barratt, George "A. Touch, William Whiteley, and Edgar Williamson, "have been appointed as a Provisional Board entrusted "with the selection of a definitive Board, whose appoint-"ment is to be subject to ratification by the shareholders "at the next annual general meeting of the Company." The statement that "terms have been arranged" will arouse some curiosity as to their nature; and the selection of the new Business Manager and Board—especially in gas circles, the representative of the gas industry—will be looked for with equal interest. In connection with the first-mentioned position, the name of Mr. Peters is being freely bandied about. The Advisory Committee are not letting the grass grow under their feet; and we think it will not be long before we shall see something like a restoration of confidence in the concern.

The South Metropolitan Gas Company and the Referees.

The "smouldering disagreement," as we termed it in the "Journal" for the 10th ult., between the South Metropolitan Gas Company and the Gas Referees, with respect to the clearing of the supply-pipes to the testing-stations, appears to be likely soon to burst into a flame. It will probably be remembered that the subject was reported upon by the Public Control Committee of the London County Council on the 3rd ult., and discussed at the ordinary meeting held that day, when a resolution was passed urging the Board of Trade, who had been ineffectually appealed to by the Council on the matter, to deal immediately therewith. The effect of the dispute was to delay the opening of the testing-places in Hill Street, Peckham, and in the Blackfriars Road; and the Council thought it should be put an end to. This vigorous action has caused the Board of Trade to move. The Public Control Committee will report to-day the receipt of a communication from the Board, stating that they have instructed their Solicitor to submit a case to the Law Officers of the Crown, with the view of being advised whether the prescription with regard to the service-pipes is *intra vires* of the Referees, and, if so, whether it would be advisable for the Board to move the Attorney-General to take such steps as are necessary to enforce compliance with its demands. It will be interesting to see what will be the next move.

Carburetted Water-Gas.

The progress of carburetted water gas in this country seems to have been arrested to some extent during the past year or two. We have only heard of an occasional new contract; and, excepting perhaps Leeds and Oldham, they are not on a particularly large scale. Our information on the point may be wanting in completeness. But for what contracts there are now going, there is, we know, keen competition among the contractors in this special branch of gas-works plant; and this gives the impression that new work is not now so plentiful as it used to be. If this impression is true in fact, then it is not difficult to find causes which have contributed to the curbing of progress. There is no doubt that the Home Office inquiry and report had a disturbing effect. Oldham (whose new water-gas plant we are describing this week) is a case in proof. There, Alderman Hanson, the Chairman of the Gas Committee, tells us, the question of adopting water gas was for a time held in abeyance in the expectancy of Governmental restriction. Then again the

turn of the tide in favour of inclined retorts has, no doubt, to some extent diverted attention from carburetted water gas; and the price of oil at one time was not altogether kind to this form of gas manufacture. But this cannot be said to-day.

Oil, Legislation, and "Collateral" Advantages.

We have it on the authority of one well-known Oil Company that, towards the end of last week, the price for solar distillate, *ex* wharf London, was 2½d. for delivery up to June, 1903. But on the same date last year, there was very little business doing; and the price ruling was 3¾d. in the same position. But in May-June, when the gas companies commenced to make their contracts for delivery up to June, 1902, the price fell to 3¼d.; so that really the comparison should be that for new contracts the price is 2½d., *ex* wharf London, as against old contracts of 3¼d. in the same position. On the surface, there is something irreconcilable between this drop and the report that the oil companies are well-nigh filled with contracts. But then we have the anomaly of last year that, when there was very little business doing, the price was 3¾d. Another prominent Oil Company tell us that at the present time they are sellers in London at 2⅜d. per gallon, and 2⅝d. per gallon at the outports, free on rail in seller's cars or delivered to craft. This time last year the quotations were about 1d. per gallon higher. This is a confirmation of the considerable drop during the year. With the tempting price now ruling, and the fact that the Government do not appear to be in any particular hurry to legislate on, and regulate, the supply of carburetted water gas, we ought to have a little more life in the plant-producing line than we have done of late. Even supposing, at some future date, there is a limitation imposed by Parliament, if it accords with the Home Office recommendation, water-gas suppliers will not have much to complain about. The cases in which the supply of carburetted water gas exceeds the suggested limitation are but few; and the "collateral" advantages about which we have heard so much are of such value that they cannot be altogether neglected in considering the question of the adoption of the plant. Just after the last spell of foggy weather—during which certain works were placed in somewhat straitened circumstances in connection with their gas supply—an engineer of a works not far from London informed us that, throughout his gas engineering career, he had never, on his days of greatest and sudden demand, had such comfortable times as since he had adopted water-gas plant. Such an experience not a few gas engineers (more especially if asked when abruptly encompassed with fogs) would agree is worth a price.

Liverpool Moving for Legislation on Water Gas.

Liverpool was the seat of the agitation which brought about the Home Office inquiry into the supply of carburetted water gas; and Liverpool will in all probability be the first to again stir the Department into action. So far back as May 31 last, the Electric Power and Lighting Committee, without any apparent reason, appointed a Sub-Committee to reopen the question; and after expending six months, we suppose, in a fruitless search for fresh evidence to justify them in again asking the Company to reduce the proportion of the carburetted water gas in their supply, they instructed the Town Clerk to write a letter to the Company urging them to give earnest and serious consideration to the recommendations in this regard of the Departmental Committee, in order to render the supply "safe and innocuous to the "consumers, which the Committee are advised it is not at "the present time." The Committee must be composed of simple-minded persons if they thought that, on such a vague statement as this, the Company, without any proof of a moral or other claim upon them, would go and upset all their plans and works in order to comply with suggestions yet unapproved, and the importance of which is manifestly not very highly valued, nor their urgency recognized, by the Home Office. When the Company know what are the legal requirements, or, we have no doubt, if they have incontrovertible evidence that the supply of carburetted water gas is doing the community a grievous and terrible wrong, they will at once bring themselves to the task of dealing with the position. But there is really no call upon them, either moral or legal, to do anything of the kind now; and so, although not in these precise terms, they have told the Committee. The upshot of the present resuscitation of the question is that the Sub-Committee have suggested that the Council should ask the Home Secretary to receive a deputation from the Corporation on the matter, with the view of urging on the Government the desirability of introducing a Bill to carry into effect the recommendations of the Departmental Committee.

The Engine of the Century.

The name of Mr. Dugald Clerk is so well known in connection with the gas-engine and its development, that everything he says on the subject commands careful attention. It is therefore scarcely necessary to bring specially under our readers' notice the extracts given in another part of the "JOURNAL" from the interesting lecture he delivered last Tuesday before the Institution of Engineers in Scotland, of which Mr. Foulis is President for the year. He and the lecturer have both worked hard to solve some of the problems connected with gas-engines; and their labours have been practically concurrent—Mr. Clerk's first patent being taken out early in 1877, and Mr. Foulis's during the following year. Though, as we well remember, an attempt was made earlier to popularize the Lenoir engine, the commercial history of the gas-engine may be said to date from the year 1876, when Dr. Otto patented the form of engine which is now so generally known under his name, and of which, Mr. Clerk tells us, there are about 85,000 now at work in England and on the Continent. This represents a quarter-of-a-century's progress. Mr. Clerk directed the attention of his hearers to Seraing, in Belgium, where there is in operation probably the largest single-cylinder gas-engine in the world, giving 1000-horse power with town gas, but some 600-horse power with blast-furnace gas, and converting into indicated work in the cylinder 28 per cent. of all the heat put into it. He also showed them, in Luxembourg, the largest and most powerful gas engine central station in existence for generating electricity by the aid of similar gas. And we are not far behind in this country. What is to be the next development? Mr. Clerk looks to the employment of gas-engines for marine purposes; and he told his audience—many of whom were shipbuilders—that to this end the problem for solution is to get rid of the gasholder. Active brains, both in this country and in Germany, are engaged upon it; and it will eventually be solved. As the last was the century of the steam-engine, so, in Mr. Clerk's opinion, the present will be the century of the gas-engine.

Mr. Duff's Compensation.

Mr. J. Shiress Will, the agreed Arbitrator between the Morecambe District Council and Mr. William Duff upon the compensation question at issue between them, has administered a rebuff to the former which they well deserved. Under the Act passed in 1900, the Council acquired the gas-works; and with the works they took upon themselves an obligation to compensate Mr. Duff on his retirement from the service. The Council since seem to have had a desire to wriggle out of their obligation, or, if that is putting their attitude a little too strong, they showed an utter incapacity in interpreting the meaning of compensation to a man of Mr. Duff's position and length of service. In the proceedings before the Arbitrator, they endeavoured to drag into the computation a gift to Mr. Duff of £2000 made on the winding-up of the Company, which brought down the amount which they considered due to him to £150. What a personal gift of this kind has got to do with compensation from an altogether different party, it would require at least a supernatural influence to make one see. However, Mr. Shiress Will was not impressed by the Council's extraordinary argument; and he altogether ignored the contention—treating the compensation, as Mr. Duff had a right to expect that it should be treated, as an entirely distinct matter. He has given Mr. Duff £3800, as against the £5993 which he claimed. It is curious to note that, if the £150 is added to the gift of £2000, and the result is deducted from Mr. Duff's claim, we get to within £43 of the amount which Mr. Shiress Will has awarded. But readers must not assume that we think this is how the learned Counsel arrived at his award. Under all the circumstances, the £3800 appears to us to be an equitable compensation, and upon it we may congratulate Mr. Duff, as will his numerous friends in the North. It is anyway a victory for fair recognition of services in the gas profession. Since writing the foregoing, we learn that the whole costs of the arbitration will fall upon the Council,

which makes their defeat the more complete. At the lowest estimate, the costs are expected to amount to £400.

Coronation Illuminations.

It behoves all companies and corporations responsible for the supply of gas, both in the United Kingdom and in the Empire's various Colonies, to bestir themselves and make what preparations they can in anticipation of the extensive illuminations that are sure to be indulged in next June on the occasion of the Coronation of His Majesty King Edward VII. Gas is so particularly suited to this purpose that there is no doubt, in spite of all precautions possible to be taken, the resources of many undertakings will be severely taxed to meet the demands which will arise. Under these circumstances, the plan adopted by the Gaslight and Coke Company, in order to get an idea of what the requirements are likely to be, is a good one. To their accounts for the past quarter the Company have attached a slip requesting consumers who are proposing to illuminate their premises by means of gas devices, to notify their intention at as early a date as possible. We trust that the response will be a gratifying one to them, and that the display made in London in celebration of the Coronation of our King may serve the double purpose of proving the deep loyalty of the people and of helping to restore to a more robust state of health that very sick patient, the "balance carried forward" in the Company's accounts.

A Gas-Meter Explosion.

The inadvisability of coming to a hasty conclusion, even when this conclusion appears to be obviously the correct one, has been clearly exemplified in the case of a fatal gas explosion which took place at Hyde early in the present month. A man in the employ of Messrs. J. & J. Braddock was engaged in fitting a new drum to a station meter; and the job was completed, with the exception of putting the requisite quantity of water in the meter, when the man's assistant (at his request) struck a match for the purpose of discovering a leakage. Almost immediately after the match had spent itself, an explosion occurred, killing instantly the man in charge of the work. According to the first reports, there seemed to be no doubt (in spite of deceased's experience) that this was another instance of that very common form of foolishness, searching for a gas escape by means of a naked light. At the adjourned inquest, however, a totally different complexion was put upon the matter. It was leakage of water the men were trying to trace; and the lighted match, being held near the bottom of the meter, was below the gas level.

And its Cause.

Mr. Thomas Newbigging (who gave evidence) said that, after visiting the spot and examining the meter, he had come to the conclusion that the explosion was caused, not by the match struck, but by the flame of a gas-bracket about 4 feet away. It was explained that a temporary connection had been made for the supply of gas to the premises while the work was in progress; but when the accident occurred, the meter had been connected up again —the inlet-valve being closed, and the outlet open. Mr. Newbigging's explanation of the matter was that some gas had returned from the premises, through the outlet-pipe, into the meter, and, escaping at the back of the meter from a small hole used for regulating the water, which was open, became ignited at the flame above, thus exploding the gas in the meter-drum. This gas-jet, by the way, was said to receive its supply from a separate source, which accounts for it remaining alight after the temporary connection was removed and before the meter-inlet was opened. We are glad that the full investigation made has exonerated the unfortunate man from the gross carelessness of which the striking of the match and the quickly succeeding explosion at first seemed to indicate that he was guilty.

It appears from the recent competition at the Grand Palais in the Champs Elysées, Paris, that alcohol can hold its own against petroleum generally, and coal itself in some cases, as an economical source of light, heat, and motive power. At the present prices in France, from 50 c. to 60 c. per litre (mean 2s. 2½d. per gallon), debased alcohol, mixed with a carburizer which increases its calorific power, has been found to be practically on a par with petroleum; and M. Sabatier asserts in the "Matin" that the price might be reduced to that which is now general in Germany, or by more than 50 per cent.

WATER AFFAIRS.

Water Charges and the Trade of Dundee.

In the "Journal" a fortnight ago, we commented upon the circumstances which had given rise to a controversy at Bradford on the subject of the charge for water for trade purposes. It may be remembered that manufacturers are charged a slightly reduced rate for all water above a certain quantity; and the question at issue is whether they are not being unjustifiably favoured at the expense of the domestic consumers. In noticing the matter, we dealt in the main with facts rather than adduced arguments in support of either party to the dispute. The subject had been referred to the Water Committee of the Corporation; and consequently it was, in a sense, *sub judice*. At the same time, while fully recognizing the prior claims of the domestic consumers, we ventured to suggest the advisability of a liberal treatment of the manufacturers, considering the extent to which the financial well-being of the town depends upon them. Bradford is the acknowledged seat of the spinning and weaving industry in England; and its gradual growth is shown by the large number of mills now running. It would therefore appear to be the right policy for the Corporation to stimulate that growth by encouraging suburban manufacturers to come in rather than check it by imposing conditions of existence within the municipal boundary which would be more onerous than those outside. In other words, the endeavour of corporations of towns possessing a staple industry should, it seems to us, be not only to maintain that industry but to increase its proportions; and if its growth renders an enlargement of boundaries necessary, to make it worth the while of outsiders to favour such extension.

This, however, does not appear to have been the policy of the Dundee Corporation, judging from correspondence which has been going on for several weeks in a local paper. Something like twenty years ago, they assumed an attitude towards the burghs and districts outside the city which was directly calculated to make them resent any proposal that they should come within the municipal boundary. To take as an example the only matter which can be noticed here—that of water supply—Dundee agreed to provide these outside places with water at the same rates as those charged in the city; and they ratified the agreement by Act of Parliament, by including them within the area of compulsory supply. What has been the effect of this? So far as we can gather from the correspondence, the Corporation have spent £47,335 on behalf of the suburbs, and in the last financial year furnished them with 356½ million gallons of water, for which they had a revenue of £5716. If 6 per cent. is charged on the above-named capital outlay, to cover interest, sinking fund, depreciation, maintenance, &c., there is left a net revenue of £2876 to pay for the large quantity of water above named, which works out to just about 2d. per 1000 gallons. Not content with remaining upon their own side of the Tay, the Corporation have crossed the river in order to supply Tayport. This incursion into Fifeshire has cost Dundee £24,000; and the total revenue return is £1752, for a supply of 83 million gallons of water. Why they should have considered it advisable to take their water to a small place separated by a mile of sea is not very apparent. However, the outcome of the Corporation's very liberal treatment of the outlying districts has been that the residents therein have been secured an ample supply of water at just the same rate as though they were dwellers in the city. Contrasting this condition of things with Glasgow, what do we find? There the Water Commissioners supply water to the suburbs (they have never refused it to any of them), but they charge a double rate for it; and no reduction is made until the suburb becomes a part of the city itself.

What has been the effect of the two policies? Glasgow offers to the outsider an inducement, in the shape of a 50 per cent. reduction in his water-rate, to come within her boundaries. The inducement proves irresistible; and the result is that she has of late years expanded greatly by the inclusion of certain old burghs without serious opposition or expense, and has thus added considerably to her population and influence. Dundee, on the other hand, encourages her suburbs to stand aloof—and they take care to do so, while enjoying all the privileges of citizenship. Both the domestic ratepayer and the industries of the city have been seriously affected by this policy. Had it not been pursued, there seems to be no reason why the water-rates in Dundee should

not have been as low as they are in Glasgow. Such a condition of things is well calculated to bring new industries to a town; but people would hesitate to erect works and equip them with plant in a place where 6d. per 1000 gallons is charged for water, if they could establish and carry on their business equally well in one where the charge was about half this figure. There does not appear to be any reason for doubting that the policy of the Corporation is hampering the trade of the city, which, as is well known, is almost entirely dependent upon the manufacture of jute. The competition with Calcutta has not only recently stopped its growth, but claims every year an increasing portion of it. Moreover, the last census returns show that the increase of population during the past decade was far below that in the preceding ten years; the numbers being 14,881 and 5161 respectively. Judging from the correspondence to which reference was made at the outset, some of the citizens are beginning to think that a great blunder was perpetrated in the past, the detrimental effects of which are now being keenly felt. The municipal councillors appear to have been ignorant of the financial effect of the arrangement with the outside burghs until a return specially relating to them was moved for some months ago. Though it has been a revelation, we do not see how it can be made instrumental in altering the existing conditions. Some change, however, seems to be urgently called for, if the trade of the city is not to stagnate and then decline; and the sooner the matter is seriously taken in hand the better.

The Flow of the Thames.

WHENEVER London happens to be passing through a period of dry weather in the summer time, it is a very common occurrence—indeed, we look for it as a matter of course—for the newspaper contributor to turn his attention to the Thames, in the hope that he may be able to make "copy" by producing some more or less erroneous figures to show how that noble river is being "depleted" by the operations of the London Water Companies. If the London County Council do not happen to have risen for the summer recess at the time, the subject is taken up and used as an argument in support of their project for going to Wales for an auxiliary supply. This is the sort of thing we have been accustomed to for the past few years, and therefore do not take very much notice of it. We believe the Thames and its watershed will supply all London's requirements for some time to come. It must be acknowledged that occasionally the river runs low, but certainly not anything like so low as its detractors make out. For instance, the "Daily "Telegraph" last Thursday contained the gratifying statement, from a piscatorial point of view, that though the sewage effluent at Barking is destitute of the oxygen which is essential to fish life, the tideway becomes re-oxygenated when enough water flows over Teddington Weir to carry the effluent out to sea. Unfortunately, however, the writer went on to remark, "London uses such vast quantities of Thames "water for drinking and washing, that the flow over the weir "is sometimes as low as 37,000 gallons a day." We should very much like to know when the Thames has ever been so "depleted" as to be in the condition above described at Teddington Weir. Never within the memory of man, we should imagine.

It may possibly be said that the figures above quoted had been misprinted for millions. Even so, they are very far rom the truth. In the summer months of 1899 (July to September), the average flow of water over Teddington Weir was certainly much below 200 million gallons a day; but in October it rose to 259 millions. In the following year, the flow in June, after the abstraction of the supplies of the Water Companies, was 443 million gallons; and in the three succeeding months, the average was about 230 millions. Last year, towards the end of July there was an exceptional drop, after the Companies had taken their supplies, to 84 million gallons; but about a month later the figure had gone up to 112, and early in September to 121 millions. The natural flow of the river in the three months named was practically the same—252, 254, and 259 million gallons respectively. Of course, these are the dry months. The Thames reached its highest point last year on the 5th of January, when the natural flow was 3563 million gallons, of which 102 millions were taken by the Companies; leaving 3461 millions to go over the weir. As the average quantity of Thames water supplied to London during that month was about 107½ million gallons, enough water passed over the weir on that day to provide the required quantity for a month, with 125½ million gallons to spare. This does not look like depletion.

Vyrnwy's Second Pipe-Line.

When an expenditure of over three-quarters of a million of money is involved, it is something to marvel at that a large public body like the Liverpool City Council should be found so unanimous as they were on Wednesday last. It is true the subject they were voting upon is a work absolutely essential to the development of the great scheme of water supply to which the Council committed themselves twenty-three years ago, and essential to the obtaining of the second instalment of benefit from the already considerable outlay on the works. Notwithstanding this, it is something of which the Water Committee may be proud, that their Chairman (Alderman Burgess) had only to make a speech showing that there was urgency in commencing the laying of the second line of pipes through the 63 miles of country which separates Vyrnwy and Prescot, at an expense of £785,000, to secure there and then the whole voice of a sympathetic and compliant Council. The first section, which is computed to cost £116,000, and which will traverse Prescot to Norton, is to be at once put in hand. Four years, however, will elapse before the whole work is accomplished, and that, as Alderman Burgess's figures elsewhere prove, will be none too soon. Those who have had charge of the Vyrnwy works have judiciously postponed the laying of a second pipe-line until the water was actually needed. Perhaps they have sailed a little close to the wind; but they have saved the citizens the largely enhanced water-rate which would otherwise have been required.

Facts and Figures.

Last week we reported the extraordinary way in which the estimates for the Midhope water scheme of the Barnsley Corporation have been exceeded in carrying out the work; and now we learn of a large increase in the estimates of the Tees Valley Water Board in connection with their new reservoir at Longnewton. In the former case, works which were estimated to cost about £186,000, had up to September last entailed an outlay of £165,000, while it was calculated that a further sum of £122,000 would be needed for their completion; and with regard to the Tees Valley Water Board, the present estimate of the cost of the reservoir in question is stated to amount to £100,000 more than the original estimate of £152,000. In both instances it is contended that this increased expenditure could not possibly be avoided; but it is manifestly a most unsatisfactory state of affairs. Of course, it is true that during the recent briskness of trade the prices of all materials rose enormously, and to a great extent this rise may have been impossible to foresee; but would it not be advisable, in the preparation of estimates for such extensive works, to allow a little more margin for these contingencies? It would be infinitely more satisfactory to discover, on the completion of a job, that there was a small amount of money in hand on the estimated price, than it is to find that the cost has been perhaps 50 per cent. or so greater than was originally anticipated. At any rate, the cases in point will lead those who have, during the trade boom, been obliged to ask for estimates for the carrying out of large undertakings, to anticipate, now that prices have fallen, that the work will be completed at much less than the calculated cost.

Future of Gas as Fuel.—Dr. Oliver Lodge, the Principal of Birmingham University, has taken an opportunity of expressing his belief that gas as a fuel will in the future largely take the place of coal, and that we shall thus get rid of the smoke nuisance in towns. Addressing the University Engineering Society, the Doctor contended that the heating of towns, and to some extent furnaces also, could be done very much more conveniently and cleanly by means of gas than it at present is by coal. The existing gas-fire, however, he said, was not satisfactory; it often smelt, and was then an abomination. This was mainly because the price of gas was so high that nobody dared burn enough of it to get a good draught. Gas for fuel should be supplied in such large quantities that it could be sold cheaply; but the great difficulty to be faced would, he thought, be the mains for conveying it. Dr. Lodge concluded by drawing a brillant picture of the future, when coal shall be entirely banished from our towns, and fuel gas be made at the pit's mouth—or, better still, down the pit itself, so as to obviate the raising of the coal.

ESSAYS AND REVIEWS.

INCLINES AND THEIR FEEDING ARRANGEMENTS.

First Article.

THERE has been a lull in the inclined retort controversy; and for this we are sorry, inasmuch as it is a subject on which, in whole or even in part, we are yet far from a oneness of opinion. Around the fundamental principles, the structural elements, and the progressive operations from the beginning to the final results there is disagreement wide and divergent. There is a strangeness about this haze which is impenetrable by the outsider; and the question is not put with too much severity when we ask, Does it not stand to the shame of the engineers of the fifty or more works who have adopted the system in this country that it should be so? Surely the system is not so complex in its details and operation, that we cannot now arrive at all events at what is the right and best practice to be pursued in order to realize the best value for outlay, and to obtain average figures which may be placed in comparison with other systems. If only our engineers experienced in inclined retorts would bestir themselves to this end by conference or by the appointment of a Committee, we feel certain that something comprehensible and valuable to the profession would be obtained, and a great deal of the haziness which now envelops the whole question would be cleared away. Local circumstances will, of course, always occasion variation; but carbonization by inclined retorts, as Mr. Herring has remarked, is not such an "inexact science" that something cannot be done to give to the system the dignity of an approximate standard, anyway in regard to working costs for the purposes of comparison. Everyone of the engineers who have installed inclines must have had something to go upon before he renounced horizontals in favour of inclines; and now he has, and all have, added a vast amount of experience to that knowledge which induced acceptance of the system. Until the gas profession gets the approximate standard for which we have already put in a word, we feel confident that inclined-retort men will find greater difficulty than ever in proselytizing men of the old school.

We hold Mr. Herring to his pledge to bring the question of the appointment of a Committee before the next meeting of the Institution of Gas Engineers, to consider whether they cannot formulate a series of questions for circulation among the users of inclined retorts, in order to derive comparative figures as to results, and to provide for horizontal men and critics of the inclined system something which they can accept as authoritative and as a criterion—approximate, if not positive. It would not, however, be fair to ask such a Committee to go further than this, and to take upon their shoulders the additional task of arbitrating in the matters which have been the subjects of mild controversy upon essentially engineering features of the system. But it must be borne in mind that it is upon the equipage of the system that, in large degree, its ultimate success depends; and so we think it is a pity that something absolutely definite did not issue from—we were about to write "the contest," but that would be a misapplication of the term, for, on the structural questions referred to, the arguments on one side were almost unopposed, and the arguments themselves were faulty in that they were not reduced to figures which could be used for comparative estimate. We have kept ourselves clear from any expression of opinion in regard to these engineering questions, leaving the experts, if so they felt disposed, to fight the matter out. All we have so far done has been to publish the expert's views on the matters in dispute as they have been communicated either in writing or personally, and to describe conscientiously and frankly, what we have seen when visiting some inclined installations variously constructed. There we have stopped; but in the unsatisfactory position in which the matter of these engineering questions stands to-day, we do not want others to stop. Many there are who desire to get down to bottom-facts; and, in order to renew interest in the matter, and to place the questions still undecided on a fairly debateable level, we have been to some little pains to get together information and views which we hope will act as an incentive to further discussion, and contribute to a settlement of the disputed points.

There is no need for apology for making an effort to keep alive the questions surrounding the inclined system. It is an indisputable fact that the gas manufacturing side of the industry is now passing through a very critical period; and we seem to be floundering about in considerable uncertainty. Therefore it is necessary that the best thought should be given to all questions of construction and operation, both in regard to their first and ultimate economy. In the presence of competition in lighting, and of high prices for raw material, the question of the adoption, as rapidly as circumstances will allow, of the most efficient and improved methods that invention offers the industry, is of supreme moment for its continued progress in the front rank of the great productive industries of the day. We are not propagandists for the inclined any more than for any other system of advanced retort-house work. But the inclined method is the newest; and in it there are—few will contradict and many can prove—great possibilities for economy in comparison with the old hand and scoop charged horizontals.

Let us follow this point up. There are in England alone 314 gas-works each with an annual make of over 30 million cubic feet of gas; and we will assume for argument that this capacity of plant admits of the economical introduction of inclined retorts. Many engineers, it is well known, are convinced of their economical applicability in the case of even smaller outputs. The grand total capacity of these 314 works is 135,363,500,000 cubic feet. At present we know of (say) about fifty works in which inclined retorts are used, and from which inclines, it is estimated, about 22,603,750,000 cubic feet of gas are made; so that we have out of the 314 works (taking it that our figures approach the mark of accuracy) the enormous quantity of 112,759,750,000 cubic feet of gas produced by other and older methods. The first point to be considered is, of course, the estimated saving, and to get an idea, we assume that to make the 112,759,750,000 cubic feet of gas 10,250,886 tons of coal are required, calculating the yield per ton at 11,000 cubic feet. All inclined-retort engineers—there may be one exception—show cheaper carbonization results than under their old systems; and, taking half-a-dozen or so representative installations, we find the savings attributed to the adoption of the system work out to an average of 16·2d. per ton. We do not suggest that the whole of the 10,250,886 tons are carbonized on such antiquated horizontal systems that an all-round saving of 16·2d. could be achieved. But as we must have some figure to show the potentiality of the system in regard to costs, we take this 16·2d.; and, multiplying it by the 10,250,886 tons, we find the remarkable total of £691,934, a portion of which, at any rate, is within the reach of a large number of works if and when they exchange old carbonizing systems for new. Many engineers still remain doubtful on the point whether there is an actual saving. We admit that, owing to the varying methods of computation, differences of a few pence in the saving per ton of coal carbonized are shown by different men; but, as to there not being an actual saving on their old working, we are not prepared to admit that the whole of the fifty engineers or so who have adopted the system are fools or knaves.

Stripping the figures already given of their explanatory matter, we have—

	Cubic Feet.
Annual production of 314 gas-works	135,363,500,000
Estimated production of (about) 50 inclined-retort installations	22,603,750,000
Estimated quantity produced by old methods . .	112,759,750,000

To make which, at 11,000 cubic feet per ton, would require 10,250,886 tons of coal.

Average saving on former methods of carbonizing 16·2d.
10,250,886 tons × 16·2d. = £691,934.

A large part of which, engineers using inclined retorts declare, may be saved to the industry and to the consumer by the adoption of the system. And furthermore, it should be noted that this does not include the gain to be derived by the introduction of coke conveyors.

Before bringing this first article to a close, a few words may be added on a point to which our attention was recently drawn regarding the installation of the system in small gas-works. The suggestion was this, that in a works making (say) 35 millions, the installation should be a setting of five beds of six retorts, each 20 feet in length—the argument being that such an installation is adaptable to the meeting of a varying demand without having a surplus make of gas per twenty-four hours, and yet working regularly. The make of gas per mouthpiece per twenty-four hours would be about 14,000 cubic feet; so one bed of retorts would give off 84,000 cubic feet per twenty-four hours, whereas a setting of eight would yield 112,000 cubic feet in the same time. Thus with five beds of sixes, the production would be 420,000 cubic feet; and these could be let down in five sections. The same productive capacity could be obtained with four beds of eights; but then this would decrease the range of adaptability to required production to four sections. It is obvious that it would be necessary to work the eights more often under disadvantages, such as small charges or longer duration between the draws than with the sixes. A setting of sevens would work almost as well as the sixes under the circumstances of the small works; but the same floor-space is wanted as for a bed of eights, and the cost nearly equals that of the latter. At the new gas-works at Slough six beds of six 15-feet inclines are about to be put in; and there the annual make of the entire present works is about 39 millions. The Cambridge and other installations have proved that for works of moderate size, the working of beds of sixes is as near perfect as it is possible to attain under present circumstances.

In another article, we shall give a little consideration, with the view of concentrating attention upon them, to one or two recent contentious questions which are covered by the second part of the title we have chosen—viz., the feeding arrangements of inclines; these arrangements being the main points now in dispute among inclined men.

THE DEPRECIATION OF ENGINEERING WORKS.

DURING the past year, our contemporary "Engineering" has been publishing at intervals an instructive series of articles on the valuation of engineering works, which incidentally shed much light on the vexed subject of the depreciation of works, plant, machinery, and industrial effects. We cannot follow the text of these lengthy articles throughout; but it will be useful to abstract so much of the matter as bears upon the finance of gas and electricity supply undertakings, which latter, according to fashionable

municipal financial doctrines, do not depreciate at all. Gas-works are, as a matter of fact, not permitted to depreciate, which happens to be easily managed out of revenue, by reason of the special character of the manufacturing plant. It is decidedly a steadying reminder for the gas engineer, that "the design of the factory may affect the term of its profitable employment but only in an unfavourable direction." This somewhat hard saying would seem to bear the following interpretation: If depreciation of value and antiquation are to be kept down to the lowest possible limit, this can only be effected by the best possible design and the most serviceable construction. If there are any shortcomings or defects—if the factory is under or over housed, or the buildings are weak, or inconveniently arranged—the inevitable depreciation will be more rapid than it need have been. The present writer knows of instances of retort-houses, for example, which were really obsolete before they were put into use, because they were not adapted to modern requirements. Obviously, the stronger and better built such structures, and the higher their cost, the worse it is for the fund that must either bear the charge of disadvantageous working, or of the removal and replacement of the defective buildings. On the other hand, many retort-houses which were perhaps regarded as over-built when new, and have been "white elephants" for years, are now justifying themselves by their solidity of construction and consequent ability to bear the strain of the rapid working of attached machinery. The possible effect of such machinery in shortening the life of a building not properly adapted to sustain it, is a factor in the valuation of gas-works.

The adequate and due appreciation of these factors as affecting the earning value of plant and buildings, is a matter that can best be secured by the collaboration of competent outside expert opinion with the opinion of the works manager. The one would perceive defects of one order, while the other would be aware of considerations which only daily and hourly observation and experience can indicate. There is a difficult question to be decided in this connection, as to what is good or bad building, having regard to the circumstances and objects of the structure. "Jerry" building betrays itself after a few years, in the requirement of increased repairs, and the expediting of the period of absolutely necessary renewal. On the other hand, over-good building may be a mistake needing expensive allowances. It is always desirable to classify and distinguish between various works buildings with the utmost particularity.

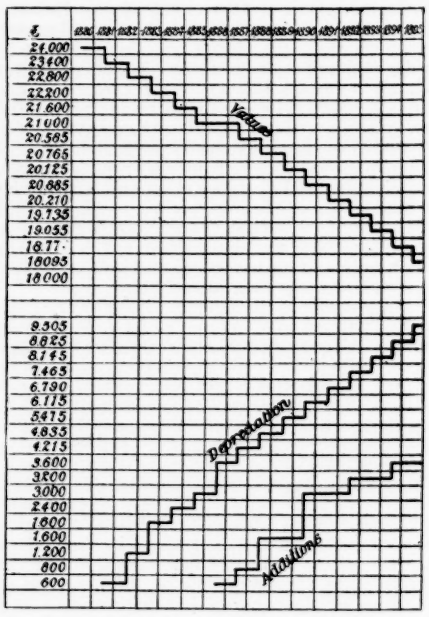
In all cases, the writer in "Engineering" is careful to point out that whatever method of depreciation is adopted, it must be clearly understood that current repairs should be kept separate and charged against revenue. The repairs are merely expenditure to prevent an accelerated rate of waste—an insurance fund to prevent the property becoming valueless through sheer neglect before its normal span. The depreciation fund, however it may be styled, or not called anything at all, is a device to avoid waste of capital consequent on lapse of time, or changes compelled by improvements and inventions in machinery or processes. The allocation of these distinct (though often mixed) charges can only be determined by a thorough expert, having the profoundest knowledge of the circumstances of the property. A competent gas manager, for example, knows precisely what portions of plant should be renewed season after season, and he cuts his coat according to his cloth. Sometimes he has to be on the alert to forestall extra profits, a knowledge of which might prove too great a temptation to a popularity-loving committee of the Board!

It is suggested that a much better plan than percentages is to assume the period of life of every separate piece of plant or structure, and, after allowing for its break-up value, to write off (or allow a sum for keeping up) the annual proportions of this total. This appears to be a hard-and-fast rule which would scarcely suit the circumstances of many undertakings of a livelier nature than statutory water-works. The element of judgment must come in; and here a word of caution may not be misplaced. "There is, apart from technical knowledge and skill, in the constitution of most men a propensity to overrate their own possessions, and a sanguine belief in the estimation in which they will be held by others." Unless this natural tendency is strictly controlled, it may lead to serious financial trouble. It is notoriously difficult for a works manager to put an exact value on his plant and appliances.

"Deterioration of both machinery and buildings is largely disguised during the first year or two of their use." It is difficult to imagine that such perfect new machinery is growing weak and obsolete from the first revolution. Corporation electric lighting committees cannot believe it. Yet it is so; and in a way that no repairs can make good. And the aging of machinery is accelerated by unintentional overstrain, such as it is often called upon to bear. Besides, certain machines, and particular parts of machines, wear out faster than others. These, and many other considerations that could be named show how difficult it is for an engineer, even in good faith, to decide upon a percentage of depreciation which can be relied upon to keep the earning capacity of a manufacturing plant up to the level of new machinery. And especially is this the case when the bulk of the investment is in the more perishable kind of appliances.

Gas-works are a very stable kind of factory. Before the modern introduction of so much labour-saving machinery, scarcely any part of gas-works plant could be said to wear out—except the retort-settings. Nowadays, of course, adequate allowance has to be made for the renewal of carbonizing and coal and coke handling machinery, which wears out quickly. Electricity generating and distributing plant, on the other hand, is subject to rapid depreciation. Generally speaking, where manufacturing plant has an unmistakably brief life, like gas-retort settings, there can be no serious error as to the necessary allowance for renewals. It is when the plant has a longer and not well-defined life—as in the case of boilers and steam-engines, and electric mains—that blunders may be perpetrated. Really, the difficulty experienced by non-technical persons in realizing that the depreciation of a machine begins from the moment it is put to use, is removable by charging a lower rate of depreciation against it, if this rate is made uniform throughout and starts early, than would be necessitated if nothing of the kind were begun until it was evidently needed. On the whole, the first system is far and away the fairest. It is difficult, however, to rightly judge the span of life of such perishable property as boilers. A boiler which would last for twenty years under some conditions, would be used up in three or four years in other circumstances. It is important to note that the inspection of boilers by insurance companies, now so general, will not prevent undue decay; it will only prevent the boiler being worked when it has prematurely arrived at a dangerous condition.

After discussing the various ways in which a depreciation allowance can be made, and its amount be arrived at, the writer in "Engineering" shows how the whole matter may be exhibited for the guidance of boards, by the aid of diagrams like the following.



Note.—In the diagrams for use, the lines should be equally spaced for amounts of £10 or less.

This exhibits the current state, year by year, of an undertaking which cost £24,000 in 1880, and began by setting aside £600 a year for depreciation of the original plant. It is almost needless to remark, that this amount of £600 a year was arrived at by separate estimates for all the different descriptions of plant in use. The traces record in their way that the original depreciation allowance was increased to £680 by the provision for various additions. These were: £400 in 1886 for additional machinery, and £200 for a new boiler. In 1887, new sheds were erected, at a cost of £200. In 1888, more machinery was added, at a cost of £600; and £200 was spent on building extension. In 1890 there appears £1000 for new machines, and £400 for overhauling. There were other additions in 1892 and 1894. The net result is that the depreciation of value of the property, regarded as an asset, has brought it from the original cost £24,000 in 1880 to £18,095 in 1895; but this is more than made up by the provision appropriated to the purpose. It cannot be too strongly insisted upon that the provision which has to be made for keeping a going concern up to date, is that which will keep it as well equipped for profit earning as any undertaking that might be started to compete with it, with all the latest appliances.

It is artlessly suggested by the "Engineering" writer that in the case of a private trading concern, when all the diagrams of value and depreciation allowance relative to the investment have been neatly drawn, they had better be kept locked away in the manager's private archives. On the part of municipal investments, however, which are not likely ever to come into the market, there is no need for such secrecy; and it would help the members of the local authorities to do their duty better to the public if the true state of all the municipal trading concerns was displayed in this fashion.

No less than forty-four applications have been received for the post of Gas Manager and Engineer at Middleton; and from these the Gas and Electricity Committee have selected six for further consideration.

ELECTRIC LIGHTING MEMORANDA.

The Burden of Poplar—East-Ender's Extravagance—Disillusionment —Mental Arithmetic at Fault.

THE information given in our "Electric Lighting Notes" last week concerning the electric light business of the Poplar Borough Council, is deserving of wider appreciation than, we fear, it is likely to meet with in municipal circles. Inasmuch as the source of our intelligence was an article in a cheap London newspaper which is nothing if not "popular," the facts cannot be made light of on the score of their origin, as might have been the case if the tale had been first narrated in these columns. By whomsoever told, however, the story of the electric lighting "enterprise" of the Poplar Borough Council is a melancholy one of illusion, rash adventure, and bitter disappointment. Poplar lies in the district of the East-End of London supplied with gas by the Commercial Company; and it was not so long ago that many people would have held the whole region too poverty-stricken to offer much of a field even for cheap gas. Mr. H. E. Jones, the Engineer and General Manager of the Commercial Company, has spoken on more than one occasion of the sustenance of the undertaking as lying "very close to the bone"—acknowledging at the same time that there was always "something there." It is surely superfluous to do more than refer in passing to the bulk of spoken and written testimony that exists as to the poverty of the East-End of London. It is proverbial. Church collections are made for the region in richer parts of London. Magazine writers hie them to the East-End as for a "safe draw," when they need subjects for lurid articles about the disastrous effects of alien pauper immigration, the "submerged tenth," and heart-rending matters of a similar kind.

As not unfrequently happens, the natives of this region and their elected notables do not share the belief in the utter wretchedness of their circumstances. So little did they realize the legend of their misery, that in 1897 the then Poplar Vestry accepted buoyantly a proposal to undertake electric lighting, which, of course, they were well assured would yield a handsome profit on the initial outlay, estimated at £45,000. At the local inquiry, the capital sum had grown to £62,000, as is the usual way of such estimates; and by the time the new Borough Council succeeded to the undertaking, it had run into the comfortable figure of £174,000. "Direct employment" was probably responsible for some of the excess over the estimates, as a vestryman of those parts who cannot look after his friends is unthinkable. We are free to say as much, seeing that the race no longer exists, save in fossil form. There being little or no demand for private electric lighting among the "docker" population, the old Vestry promptly provided a public lighting connection over miles of streets, regardless of the expense. The Borough Council are pursuing the same liberal policy. Poplar is, in sooth, a highly "Progressive" place, and the echoes of the journalistic applause which greeted the inauguration of the electric lighting undertaking have scarcely yet died away. They have since been raised again in honour of Battersea, and, only last week, of Bermondsey.

These newspaper plaudits, however, although accompanied by flattering reproductions of portraits of His Worship the Mayor in cocked-hat and chain, the Town Clerk in wig and gown, and the Electrical Engineer in *pince-nez* and a reassuring smile, do not pay the piper. In the Poplar district, ratepayers are beginning to wonder who is going to foot the bill for all this municipal enterprise. The same question will arise in Battersea and Bermondsey before very long. Poplar, however, has already begun to perceive that a street lighting business, paid for out of the rates, is not exactly the ideal support for an electricity supply undertaking based on a mortgage of the same rates. It is too much like the proverbial attempt to make a frugal livelihood by taking in one's own washing, to command great popularity when the trick is once found out. The pity of it is, that those hard-headed persons who are able to understand and weigh evidence, and are consequently able to foresee the end of these adventures before they are begun, do not get a timely hearing. Talk about the need of the English people being for technical education or what not! Why, to judge from the hare-brained, or worse, commitments of members of English local authorities, what is really needed by many prominent citizens is enough simple arithmetic to teach them that two and two make four! This is a sad commentary on our vaunted educational advantages.

This is the absolute truth. Of course, the fruiterer on the borough council, or the shoe-dealer on the urban district council, do not need telling that two apples added to two apples make four apples, or that a pair of shoes consists of two shoes. Such performances as those which are actually going on around us in the name of municipal trading for profit, like the inability of a common councillor of London to understand the economics of an exchange telephone connection, go to persuade one that what these good citizens lack is the algebraic sense of number which would enable them to perceive that $2a + 2a = 4a$. What is true of the arithmetic of the apple-stall is equally true of the arithmetic of electric units; but there appears to be a break in the mental process of the popular mind which should link these ideas together. Experience will supply the needed lesson; but the fees of this most efficient school are, as the sage observed, awfully high. What is even worse is that they so often fall to be paid by the wrong people.

TRADE UNIONS AND THE LAW.

THE actual legal position of Trade Unions as defined by the two recent judgments of the House of Lords—namely, *Taff Vale Railway Company v. Amalgamated Society of Railway Servants*, and *Quinn v. Leathem*—is certain to be often discussed in the future; and a proper understanding of that position is an essential possession of every considerable employer of labour. The effects of these judgments have already been fairly considered in the columns of the "JOURNAL;" but in view of the great importance of the subject, its complicated character, and the fact that there is still divergence of opinion between various authorities as to what the actual state of the law is, it will not be without advantage to go again over the ground with the aid of a very well qualified guide. This we are enabled to do by reason of the publication in the "National Review" for December, of an article by Sir Godfrey Lushington, entitled "Trade Unions and the House of Lords," on which masterly analysis of the law bearing upon the subject the following notes are based.

In considering the legal position of Trade Unions, it is necessary to look both at their civil and criminal liabilities. Formerly, there were no civi—only criminal—actions in regard to strikes; but in both the cases cited above, the proceedings were civil, and not under the criminal law. For a civil (or actionable) offence, the guilty party is liable to damages; for a crime, to punishment, and also to damages, if damage be done. The latter is an important point; for it will be seen that, consequently, the criminal law has an extensive bearing on civil liability.

The essence of the difficulty in regard to the liabilities of Trade Unions is to discover exactly to what extent concerted action makes actionable or punishable that which would, if committed by an individual, be neither actionable nor punishable, or actionable only. This brings into consideration the law of conspiracy, which is, "primarily, criminal law. It is designed to put down acts which are especially mischievous by reason of concert or from numbers being engaged in them; and its peculiar feature, arising from the necessity of nipping such conduct in the bud, is that it strikes at the agreement itself, making the mere agreement punishable though never carried into execution." Just as it was held to be a punishable act in Dr. Krause to attempt to persuade a second party to bring about the death of a third, because for the protection of Society it is necessary that a proved intent to murder should bring the would-be murderer within the law without waiting for the crime to be committed, so it is necessary that the mere agreement to combine to do certain things, though they be not done, should be held to be criminal.

As to what at common law is a conspiracy, it is easy to say, up to a point; beyond that, no definition can be laid down. For two or more persons to agree to do anything which if done by any one of them would be either criminal or actionable is a conspiracy and, therefore, criminal. That is all plain sailing. Where the difficulty lies is to discover what acts constitute a criminal conspiracy when done or agreed to be done collectively, that if done by an individual would be neither criminal nor actionable. "This is a question," says Sir Godfrey, "very difficult to answer with precision. So vague is the law, that the late Sir Fitzjames Stephen is reported to have said that a common law conspiracy is a combination to do anything which a judge and jury might think ought to be punished; and so rare is the resort to it, that the Codification Commissioners thought it might be safely abolished."

Administrators of the law have at different times taken different views of what legal individual acts constitute a conspiracy when done in combination. At one time no such combinations have been regarded as criminal; while at another, many such have been deemed punishable, such as: "A conspiracy to restrict the free course of trade; a conspiracy to do something contrary to public policy; a conspiracy to molest a person in the exercise of his legal rights; a conspiracy to do malicious harm," or, as Lord Macnaghten calls it, "a conspiracy to injure." It is again necessary to remark that an important point lies in the fact that if damage result from a conspiracy, an action for damages lies.

Now, before 1871, a strike, or a threat to strike, was held to be a conspiracy "to intimidate." This, and the fact that the purposes of a Trade Union were deemed to be "in restraint of trade"—therefore, any contracts made by or with it were not enforceable, while not punishable at law—constituted the great disabilities of the Trade Unions. To lessen these disabilities, Parliament framed the Act of 1871, which was four years later repealed and superseded by the Conspiracy and Protection of Property Act, 1875. By this Act, it was decreed that: "An agreement or combination by two or more persons to do or procure to be done any act in contemplation or furtherance of a trade dispute between employers and workmen, shall not be indictable as a conspiracy if such act committed by one person would not be punishable as a crime" (section 3). But that: "Every person who, with a view to compel any other person to abstain from doing or to do any act which such other person has a legal right to do or abstain from doing, wrongfully and without legal authority uses violence to or intimidates such other person, or his wife, or children, or injures his property," shall be punishable as a criminal (section 7). No definition of "intimidation" was given; but the Queen's Bench Division has held (*Gibson v. Lawson*, and *Curran v. Treleaven*) that the notification of a strike is not, as it was formerly deemed to be, intimidation.

By this Act of 1875, then, Trade Unions were rendered "exempt

from prosecution for conspiracy in respect of an act punishable only by fine, or of an act constituting only a civil wrong, or of an act not actionable at all" if done by an individual, provided that the act is in every case "in contemplation or furtherance of a trade dispute between employers and workmen." The importance of *Quinn v. Leathem* lies in its bearing upon what constitutes a trade dispute, and, therefore, upon the criminal liability of Trade Unions. So far as the question of civil liability is concerned, until the judgment in the case of the Taff Vale Railway Company, it was generally believed that, while the members of a Trade Union could be prosecuted for offences or sued for wrongs committed, the Union, as such, could not be sued.

Sir Godfrey gives a digest of the several cases bearing upon the question of what constitutes a conspiracy. This shows that it has been held that the following acts do not amount to conspiracy to injure illegally:—

The concerted abstention of certain parishioners from subscribing to the sustentation fund in order to deprive the incumbent of a living of his income and compel him to resign (*Kearney v. Lloyd*).

An agreement between certain tea-merchants systematically to underbid a competitor with a view to drive him out of the market. Held that harm was intended and done, but was justified as being an act of not illegitimate trade competition (*Mogul Steamship Company v. M'Gregor, Gow, and Co.*).

An agreement between buyers not to bid for meat if salesmen accepted bids from a certain competitor (*Scottish Co-operative Wholesale Society v. Glasgow Fleshers' Association*).

On the other hand, the coercion of a builder into breaking a contract with a merchant, exercised jointly by three Trade Unions, was held to be a conspiracy to injure the merchant, another of whose customers was the party against whom the action of the Unions was aimed (*Temperton v. Russell*).

In the famous case of *Allen v. Flood*, as it came before the House of Lords, the question of conspiracy was not at issue; the case for Flood being that Allen, by himself, maliciously caused Flood's dismissal by his employers. The judgment really only decided that an act done by an individual in exercise of a legal right, though it cause, and is intended to cause, harm to another, is not wrongful and needs no justification, even if malice be present. The House of Lords did not decide that such acts done by a number of persons in combination would not constitute a conspiracy. It was therefore open to them to decide, as they did decide in *Quinn v. Leathem*, that similar acts done in combination do constitute a conspiracy. In that case, a Union threatened to call out the men employed by A if he did not cease to deal with B, who employed non-Unionists, thereby inducing A to give up dealing with B; and the Union further induced one of B's servants to break his contract by leaving service without notice.

By this judgment of the Lords, it was, therefore, decided that for one man to induce a second to break his contract with a third is a civil wrong against the third man. That was a point not before determined. But the judgment did more than decide that. It decided, to quote Sir Godfrey: (1) That "it was not a trade dispute that a trade rule should have been made by a Trade Union, disregarded by two employers, and then attempted to be enforced by a strike of the Unionists against the two employers. (2) That it was malice for Unionists to strike for the purpose of giving effect, in the case of two employers and their servants, to a rule which they had made two years before, at the very beginning, when the Union was first started—made in what was conceived to be the interests of the operatives in the trade, and not directed against any person in particular."

These acts, whether considered as individual or collective acts, amounted, in the opinion of some of the Law Lords, to infringements of the rights of others to a free course of trade, and were therefore in the nature of actionable wrongs. Having been done in combination, they consequently rendered the guilty parties liable to prosecution for conspiracy. The Law Lords were unanimous that the acts, even though they were looked upon as such as might with impunity be committed by individuals, nevertheless, when done by numbers in combination, amounted to a conspiracy to injure.

"The rights of others to a free course of trade" is the main stumbling-block here; for the interpretation of those rights is bound to differ in almost every case, and the judgment in *Quinn v. Leathem* is with difficulty reconciled with that in the *Mogul Steamship* case or with that in the case of the *Scottish Wholesale Society v. Glasgow Fleshers*. But whatever those rights may be, it is now held that to require an employer to discharge non-Unionists, or to require him to employ or not to employ any particular man or men, or to call out his men on strike—to do any of these things without the justification of a "trade dispute" is to infringe the rights of the employer to a free course of trade, and to combine to do any of those things is a conspiracy. This judgment must certainly act as a very serious and necessary check upon the wanton aggressiveness of many Trade Unions.

Sir Godfrey appears, however, to go somewhat astray in suggesting that the decision in *Quinn v. Leathem* would cover practically all cases of strikes. He says: "Their Lordships . . . do not describe what sort of strike it is that is free from what the law considers malice or molestation, and is not an infringement of the employer's right to carry on his business as he thinks fit. And with this judgment before us, it is difficult for us to imagine one." Is he not forgetting section 3 of the Act of 1875, and the fact that in *Quinn v. Leathem* it was held that there was no trade dispute? As we understand the judgment, the absence of a trade dispute was a vital point. For the men employed at a works to agree to cease work if non-Unionists were engaged would not apparently be an act coming within the judgment; but for the Union, in the absence of any dispute between those men and the owners of the works, to call the men out "in sympathy" with a strike at another works, would be an infringement of the employers' right to carry on their business, and would render the "conspirators" liable to prosecution and to an action for damages. This certainly materially curtails the opportunity for legally striking, but not so much as the above quotation would suggest.

Furthermore, such acts as those committed by the defendants in *Quinn v. Leathem* were held (apart from the question of infringement of free right to trade) to be of so injurious a character when done in combination as to constitute a conspiracy to injure; so that strikes not arising directly out of a trade dispute will in future be dangerous to their initiators. Where these are, as they almost invariably are, officials of a Trade Union, the danger is rendered real by the judgment in the Taff Vale case. That judgment, says Sir Godfrey truly, "is founded on justice and the public good;" and it will be "useless to attempt to evade it. The funds may be placed abroad, but will be found to be within reach of the Courts. Nor will liability be escaped by injunctions to officers not to commit torts. If my coachman John, driving my carriage, has a collision through carelessness, and causes damage to a third person, it is no good for me to plead that I told John over and over again to be careful. So a Trade Union will be answerable in its funds for any wrongful act done by its officers, 'acting within the scope of their employment,' whatever the instructions."

These are but imperfect notes upon an article that it will repay every employer of a considerable number of hands to digest carefully and to keep by him. It may be also recommended to the attention of Trade Union officials.

TRADE DISPUTES IN 1901.

THE number both of labour disputes and of the workpeople concerned therein, were less in 1901 than in any of the preceding eight years; but the aggregate duration of the disputes exceeded that in either 1899 or 1900. There was, however, no "prolonged general dispute" last year, nor has there been since the strike of South Wales miners—involving a loss of 11,650,000 working days—in 1898. The total number of days lost by reason of disputes last year was 3,931,000, as compared with 3,153,000 in 1900 and 2,516,000 in 1899. At 5s. per day, the loss of wages in 1901 was nearly £1,000,000. In 1893, it was £8,000,000; in 1897, £2,800,000; and in 1898, £3,500,000. For the past eight years, the loss of wages through strikes reaches the colossal total of £21,000,000; and this is without taking into account any of the wages lost by workers outside the industries directly affected by the disputes. These figures are worth the attention of the working classes.

Of the 624 disputes in 1901, 205 occurred in the mining industries, 104 in the building trades, and 101 at metal, engineering, and shipbuilding works. Of the 175,000 workpeople affected, 110,000 belonged to the mining group; and of the 3,931,000 days lost, that group accounts for 1,875,000, or nearly one-half. So that, in whatever way the figures are tested, it is found that the dominating factors in the general result are the disputes among the miners. Most of these disputes in 1901 were comparatively small affairs; the average number of workpeople affected being less than 600. But the time lost was very much greater in the aggregate than in either of the two preceding years, and must have affected the output of coal to an appreciable extent—probably a million tons.

Out of the total of 624 disputes last year, 392 arose over the question of wages. In all years, this is the main ground of contention; but it is a significant sign of the change in the condition of the labour market that there was, last year, a great proportionate increase in the disputes arising out of demands by employers for a reduction in wages. The number of working days lost on this account was more than twice as great as in 1900; while there was a decline of over 40 per cent. in the aggregate loss of time in disputes arising out of demands for higher wages. Questions of hours of labour and working arrangements were more frequent causes of dispute in 1901 than in 1900, and involved a much greater loss of time—"working arrangements" being responsible for disputes involving the loss of over 900,000 days' work, as compared with only 245,000 days in 1900.

As to the results of the disputes, statistics can give very little reliable guidance. For what the figures are worth, it may be noted that of the workpeople concerned in the strikes and lock-outs last year, 27 per cent. gained their points, 33 per cent. were hopelessly defeated, 36 per cent. compromised with their employers, while the balance were still out of work at the end of the year. Such percentages give, of course, only a rough indication of the results, and do not measure the value of the gains or losses of either side.

Of the total number of disputes, only 33 were settled by conciliation or arbitration; in 124 cases the men either came back on the employers' terms without negotiation, or were replaced; 431 disputes were settled by direct arrangement between the parties; and 36 were unsettled at the end of the year. Of the 175,000 workpeople engaged in disputes last year, Scotland provided over 50,000; Wales and Monmouth, 34,000; the North and Midlands of England, 85,000; while all the southern and western counties, including London, only contributed 5000 to the total.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 229.)

THERE was no dearth of business in the Stock Markets last week taken all round; but movements in them were very variable. The non-speculative stocks had the best of it; and the various gilt-edged issues offered were taken up with alacrity. These probably profited by the disappointment felt in the railway market at the poor dividend announcements, which were in disagreeable contrast to the first announcements in the previous week. And other departments also were lower; so that, on the whole, prices for the week show a shrinkage. In the Money Market, the feature was the reduction on Thursday of the Bank of England rate to 3½ per cent. from the 4 per cent. which had lasted from the 31st of October. The general tone of the market appears to be very firm. In the Gas Market, business on the whole was not very active; and some days were very quiet indeed. Movements in quotation, too, were few in number and irregular; there being quite an absence of any prevailing tendency, and each issue being swayed by its own circumstances. In Gaslight there was a good deal of quick-change variety in the ordinary stock, which became highly sensitive, and see-sawed up and down in response to a light touch either way. This was in view of the announcement we reported last week that, although the Company had still kept up the advanced price of gas, they were some £33,000 short of the statutory dividend for the half year. On Monday, a parcel of stock was let go at 95, and down went the quotation. But on each of the next three days, 98 was marked; and the quotation recovered all but one point. Then on Friday it fell again, and 96 was marked; but on Saturday it touched 98 again. Meanwhile, the secured issues held on very firm; and the maximum even gained a point. South Metropolitan was quiet, but very firm; the price steadily advancing a couple of points, and the closing mark on Saturday being at top price. Only two or three transactions were recorded in Commercials at good middle figures. Business in the Suburban and Provincial group was very quiet; and the only movement was a fall in Brighton and Hove original. But no business was marked in it. The Continental Companies were never quieter, only two or three dealings being the sum total of the week; and, so far as prices could indicate, the tendency was firm. There was nothing in connection with the remoter undertakings to call for notice. In the Water Companies, business was quite as quiet as ever, and the ordinary stocks hardly moved. But towards the close of the week, there was a general advance in most of the preference and debenture issues.

The daily operations were: Monday was a quiet day in Gas. Gaslight ordinary fell 3½; but the maximum and South Metropolitan rose 1 each. In Water, Grand Junction rose 1. Business in Gas was a little brisker on Tuesday. Gaslight ordinary gained 1; but Brighton original dropped 3. Wednesday fell quiet again; but Gaslight ordinary recovered another 1½. In Water, East London moved down 2. Thursday was a little more active, and South Metropolitan rose 1. Friday's operations were mostly in Gaslight ordinary, which relapsed 1. In Water, many preference and debenture issues advanced, as detailed in the list on p. 203. Saturday was quiet and unchanged.

PERSONAL.

Mr. G. R. CASTERTON has been appointed Manager of the Melton Mowbray Gas-Works. Mr. Casterton at present occupies a similar position at Biggleswade.

Dr. G. E. RICHMOND, M.D., B.A., B.Sc. (younger brother of Mr. E. W. T. Richmond) who has been in charge of the Imperial Yeomanry Hospital at Elandsfontein, returned on Tuesday last from South Africa in the hospital ship "Dunera."

The occasion of the annual dinner of the employees of the Leeds Gas Meter, Stove, and Plumbing Department, on Friday last, was taken advantage of to present a handsome travelling case, which was subscribed for by a few friends, to Mr. A. M. THOMPSON. Mr. Thompson has been appointed Superintendent of Mains and Services at the Singapore Gas-Works.

We learn that the Directors of the Staines and Egham Gas Company have appointed Mr. G. H. SAYERS Secretary, in succession to the late Mr. J. A. Engall. Mr. Sayers was for eleven years with the Canterbury Gas and Water Company; and he only resigned his engagement with them twelve months ago, on accepting the position of Accountant to the Company of which he is now Secretary.

The Carlisle Gas Committee, having considered the short list of applications for the position of Gas Manager, have agreed by a majority that Mr. W. J. SMITH, B.Sc., Owens College, Manchester, who is at present Assistant-Manager (under his father) at the Bolton Gas-Works, be recommended for the appointment. A minority of the Committee were in favour of Mr. Owens, who is employed at the works. The salary is £350 a year.

The Gas Committee of the Stalybridge Corporation have given further evidence of their gratitude to Mr. ISAAC CARR for the assistance voluntarily rendered by him on the occasion of the recent explosion at the gas-works. After having forwarded to him, through the Town Clerk, a resolution of thanks, the Committee requested their Chairman (Alderman Ridyard) to ask Mr. Carr to accept a very handsome timepiece, in a carved oak case, as a token of their high appreciation of his services on that unfortunate occasion.

We are extremely gratified to learn that Mr. W. DOIG GIBB, M.Inst.C.E., Engineer to the Newcastle-on-Tyne and Gateshead Gas Company, has just entered into a fresh engagement with his Directors. In recognition of the value of his services to the undertaking under their control, they cancelled the last six months of his old agreement, and dated the new one from that time; and we have reason to believe that the terms offered to him, in the matter of increased salary and in other respects, were such as to give him every reason for satisfaction.

In response to the invitation contained in the "JOURNAL" for the 24th ult., nineteen applications were received for the appointment of Resident Superintendent at the Nechells Gas-Works of the Birmingham Corporation, in succession to Mr. C. Richmond, whose resignation was notified in our columns the previous week. Six of the applicants were selected by Mr. Henry Hack to have an interview with him, and five of them were chosen to see the Corporation Gas Committee. The successful candidate is Mr. T. RANDOLPH MURRAY, Assistant to Mr. A. E. Broadberry of Tottenham.

We learn that SIR WILLIAM WHITE, the retiring Director of Naval Construction, will leave the Admiralty on the 31st inst. This matter would not, in the ordinary course of things, fall to be noticed in the "JOURNAL;" but it affords an opportunity for correcting a misstatement which appeared in our article dealing with the principal water events of the past year, in the number for Dec. 31. It was there inadvertently stated that Mr. Hawksley had taken the position of President of the Institution of Civil Engineers, which would have been filled by Sir William White, had not illness, "which unhappily proved fatal," prevented it.

The funeral of Mr. GEORGE HENDERSON, formerly Chairman of the Plymouth and Stonehouse Gas Company, took place on Wednesday last at Bodmin. Among those who attended, were Mr. S. H. Wilcocks and Mr. A. S. Harris, Directors, and Mr. H. B. Heath, Secretary of the Gas Company, besides several of the employees. One of the wreaths sent was from the Chairman and Directors of the Company, and another was from Mr. H. A. Willey. Mr. Henderson, who was a widower and childless, has bequeathed £1000 to the South Devon and East Cornwall Hospital, Plymouth, and £1000 to the Corporation of Bodmin; the latter sum to be invested and the income divided annually at Christmas among fifty poor widows of the town.

OBITUARY.

Mr. J. TROUNSON, Manager of the Penzance Gas-Works, was recently found dead in his bedroom. Deceased (who was 84 years of age), in addition to managing the gas-works, carried on business as an architect and builder.

Herr G. HAPPACH, the Manager of the Municipal Gas-Works at Ratibor, died on the 19th ult., after a prolonged illness. He had for many years been a prominent member of the German Association of Gas and Water Engineers, and was President of an affiliated District Association.

Society of Engineers.—The first ordinary meeting of the Society of Engineers for the present year will be held next Monday at the Royal United Service Institution. The President for the past year (Mr. Charles Mason) will present the premiums awarded for papers; and the President for this year (Mr. Percy Griffith) will deliver his Inaugural Address. By some oversight, we omitted to notice the transfer of Mr. Griffith from the class of associate member to that of member, at the meeting of the Institution of Civil Engineers on the 7th ult.

The Transactions of the Societe Technique du Gaz.—A volume containing the record of the proceedings of the twenty-eighth Congress of the Société Technique de l'Industrie du Gaz, which was held at Dieppe in July last, and duly reported in the "JOURNAL" at the time, has just been issued. It is of more than usual interest to English readers, as it contains a full account of the memorable visit—all too short—paid us by our French colleagues. We are glad, however, to receive this confirmation of the pleasure and profit they derived, and this appreciation of the efforts so willingly made for their enjoyment. The volume, which runs into nearly 600 pages, has a supplement describing the gas and electric light works at Dieppe, as well as the Portslade works of the Brighton and Hove Gas Company, and the East Greenwich works of the South Metropolitan Gas Company, all of which, it will be remembered, were visited. Plans of the last two are given. A summary of the London Gas Companies, with map, drawn up by M. Cornuault, is also included, and forms interesting reading. Where so many unfamiliar names and places had to be given, the few inaccuracies occurring may be overlooked. In fact, the last volume is well up to the high standard of the preceding ones issued by the Society; and we compliment them very heartily upon both its technical and general value.

NOTES.

Efficiency of the Meldrum Refuse Destructor.

It is stated on the authority of Mr. W. Tillery, the Borough Electrical Engineer, of Wrexham, that during the past month of December he has been able to keep the whole electricity-generating station going, including all the accessories of furnace-blowers, water-softeners, deep-well pumps, and condensing plant, with steam generated entirely by a four-cell refuse destructor of Messrs. Meldrum's pattern. The only time when coal was burnt was on Sundays and Christmas holidays, and then only to make up for possible shortage of the accumulator plant, which constitutes an essential feature of an installation of this kind. The Wrexham generating plant has a maximum load running up to 150 kilowatts; while the units generated daily run from about 600 to nearly 1000. The average of units generated per ton of refuse burnt is 37·8. This appears to be the regular working rate for last December at Wrexham, and is therefore to be regarded as a reliable rate for a long-run trial. It is reported that similarly satisfactory results are attained with the same destructors at Nelson, Grays, and Aldershot; while there is no complaint on the score of smoke or smell from the destructor chimney.

A French Government Monopoly of Petroleum.

The prospects of carburetted water gas for France are not improved by the announcement that the French Government have definitely decided to add a petroleum monopoly to their other unfortunate commercial enterprises. This is bad news for the French consumer, if it means that the internal trade in petroleum and all its residues is to be more strictly regulated in the interest of inland revenue than it is at present. The similar monopolies of matches and tobacco have become by-words for the dearness and badness of commodities treated in this way; and there is no hope that petroleum will escape the fate of matches and tobacco. The most remarkable feature of this nationalized trading for a profit is that while the public suffer severely in being compelled to purchase goods which are expensive and worthless in a superlative degree as compared with the same commodities marketed under other auspices, the State does not reap any countervailing advantage. The expenses of administration absorb most of the profits, so that only an army of ill-paid officials represents the State benefit from these monopolies; and as these are not satisfied, the general conclusion follows that French nationalized trading for a supposed profit is a complete failure.

A Concrete Specification.

The standard specifications for concrete of the Public Works Department of the State of New York have recently been revised. It is now ordered that all concrete must be so thoroughly mixed that every face of every particle of stone or gravel is completely coated with the mortar. No mixing machines with continuous action, in which the proportions of the product depend upon shovellers, are allowed. The layers in which concrete is deposited must not exceed 9 inches thick before ramming. In any given layer, the separate batches must follow on quickly so as to be rammed before setting. The ramming must be performed so as to form a compact, dense, impervious artificial stone, of a specific gravity nearly that of the natural rock which was crushed to make the aggregate. The ramming must be so thorough as to compact the concrete perfectly and to fill all voids so that the water comes to the surface and the mass quakes slightly under the blows of the rammer and shows a smooth face when the frames are removed. In order to bond successive layers, timbers 6-inch square are buried in the top of the layer as formed, to be removed before the next layer is deposited, leaving grooves to form the bond. In joining new concrete to old work, the old is to be cleaned, washed, and a thin coat of plaster applied before the fresh concrete is placed. No concrete must be slid down a shoot or tipped, but carried and deposited without dropping or rolling.

An Installation of Air Gas.

A recent number of the "Ironmonger" contained the following particulars of an installation of air-gas plant recently erected in the town of Aszód, near Buda-Pesth, and calculated to supply 1200 flames, with a possible future enlargement to 2500. The mains are 3½ miles long. The plant comprises six carburettors, which are capable of producing 2500 cubic feet of air gas per hour; the agitators in them being arranged to take up only small quantities of spirit at each revolution. The factory contains separate rooms for the carburettors, the motor, and for a photometer; also a dwelling-house for the gas maker. The spirit employed is petroleum "benzine," having a specific gravity of ·65 to ·68, stored in a 220-gallon underground tank. A small gas-motor works the carburettors, while a 2-horse power steam-engine is kept in reserve in case of emergencies; its boiler also serving to provide the steam required to warm the buildings. The plant is put into operation at 5 p.m., and remains at work till 10 p.m.; the gas consumed after that hour being supplied from a gasholder having a capacity of 4000 cubic feet. In order to avoid any condensation of the spirit in the mains, the air is only carburetted to such an extent that it takes up 250 grammes of petroleum spirit per cubic metre (say ¼ oz. per cubic foot). This product is permanent till the temperature falls to 14° Fahr.—*i.e.*, 18° Fahr. below freezing-point; it has a heating value of 2600 calories per cubic metre (74 calories per foot), and an illuminating power of 2·4 litres per Hefner unit (10·6 candles per foot). The town is provided with 70 Denayrouze burners of 25 to 30 candle power for street lighting. It is stated that eight installations of a similar character have been in operation in France since last winter, and another six are in process of construction.

Molten Platinum as a Standard of Light.

Mr. Petavel, working at the Victoria University, Manchester, has found good results from molten platinum as a standard of light. The amount of light emitted from a measured surface—say, one centimetre—of molten platinum has often been proposed for a light standard; but the difficulty of ensuring an invariable amount of radiation from different samples of the metal has prevented acceptance of the unit. M. Violle chose the temperature platinum at the moment of solidification as the standard; but although the prescription has been theoretically adopted by congresses of electricians, the difficulty of standardization of such a nature remains an obstacle to its use. On behalf of the Reichsanstadt, Lummer and Kurlbaum proposed to standardize platinum at a lower temperature approximating that of melting palladium, which is easy of attainment and maintenance. They further recommended that about nine-tenths of the total radiation should be absorbed by a layer of water, 2 centimetres thick. Mr. Petavel thinks that the reliability of the molten platinum standard might be at least brought to the limit of accuracy which physiological considerations fix to the exactitude of photometrical observations. He has melted the platinum both by the electric current and the oxy-hydrgen blow-pipe; and he considers the latter method suitable, provided the platinum be chemically pure, the crucible of pure lime, the hydrogen free of hydrocarbons, and the proper ratio of three volumes of oxygen to four of hydrogen be maintained. Under these conditions, Petavel corroborates Violle as to the brilliancy of platinum at its melting point. He has determined the light-intensity of the crater of the silent electric arc to be 147 candles per square millimetre. It was very difficult to obtain any constant result; and the electric arc crater is certainly not suitable for a standard of light.

Simple Tests for Soundness of Portland Cement.

It is remarked in the "Builder" that there are simple means of testing the soundness of portland cement—meaning its proper and regular content of lime—which users should habitually practice. Most of the trouble of cement is due to its being over-limed, which causes swelling after the work is in place. One device is to mix cement with water to about the consistency of treacle, which is poured into a common physic bottle, shaken until it is full to overflowing, and then placed aside. If the sample is overlimed, or even if the proper grinding and amalgamation of the raw materials have not been made, the cement in the bottle will split the glass, sooner or later, according to the degree of the imperfection. If, on the other hand, the cement is under-limed, it will contract in setting and become loose in the bottle. Another test is to make a thin pat of cement and water on sheet iron, which is immediately placed on top of a boiler, or somewhere else where the water will be quickly evaporated at something under the boiling point. If the cement is sound, it will remain solid and harden to a certain extent; but if over-limed or badly-mixed, it will crack more or less, according to how bad it is. Another test is to mix up a little cement with water into a very stiff paste, and allow it to set after being smoothed upon a non-absorbent plate. Then, if the surface is lightly and quickly wetted, as by drawing a wet finger over it, the rate at which the wet streak is absorbed indicates the degree of liming. If the cement is over-limed, the water will be sucked up instantly. If it is about right, it will disappear in from 3 to 6 seconds. The pat may then be placed in water, which will complete the proof. The "flourometer" test is the best for fineness of grinding, which has superseded the weight requirement per bushel as an indication of quality.

The Gas Section of the Glasgow Congress.—The report of the proceedings of the Gas Section of the International Engineering Congress held in Glasgow last September, which appeared in our columns, has been edited and re-arranged in book form by the Honorary Secretary of the Section (of which Mr. G. Livesey was Chairman), Mr. J. W. Helps, M.Inst.C.E., General Manager and Engineer of the Croydon Gas Company, and we have received a copy. The report is preceded by some extracts from the Inaugural Address of Mr. James Mansergh, F.R.S.; and these are prefaced by a few interesting Introductory Notes upon the Congress and the Exhibition of which it was one of the incidents—and a highly important one. The text of the papers is fully illustrated by diagrams and folding plates, of which a list is given; and there is an index. We cordially agree with the remark in the Introductory Notes, that the volume will possess, apart from its value to the gas profession, "an intrinsic worth as a memento of an occasion and a period in our industry which will live in its history." The book is published, for the Committee of the Section, at the offices of the "JOURNAL."

TECHNICAL RECORD.

MR. DUGALD CLERK ON GAS-ENGINES.

At the Meeting of the Institution of Engineers in Scotland last Tuesday—Mr. W. Foulis (the President) in the chair—a lecture was given by Mr. DUGALD CLERK on "Gas and Other Internal Combustion Engines." The following are some extracts from the lecture, which was amply illustrated by diagrams.

A gas-engine is a heat-engine in which the working fluid is atmospheric air and the fuel is an inflammable gas or vapour. It differs from a hot-air or a steam engine in one important point—namely, the heat to supply the motive power is given directly to the working fluid by combustion within the motor cylinder. The gas-engine, in fact, resembles a gun more closely than a steam-engine. In both the gun and the gas-engine cylinder the motive power is produced by heat; and the heat is applied directly within the cylinder, to produce the driving pressure. A gaseous explosion, however, differs somewhat fundamentally from the explosion produced in a gun by chemical action; and it is a much more controllable phenomenon than a powder explosion. In the former, there is no change of state during the reaction from solid to gas; on the contrary, the volume of the gases formed by combustion, reduced to standard temperature and pressure, is less than their original volume before combustion. In the gaseous explosion the increase of pressure is due wholly to the increase of temperature of the gases entering into the chemical action.

Before proceeding with the description of the mechanical features of the gas-engine, it would be desirable to consider briefly the nature of a gaseous explosion. If air at 0° C. and atmospheric pressure be confined within a closed space—say, a closed vessel—and then heated, for every increase in temperature of 1° C. the pressure would increase by $\frac{1}{273}$—that is, when the temperature is raised to 273° C., the pressure within the vessel would have increased two atmospheres. At a temperature of 546° C., the pressure will be three atmospheres; and the pressure will continue rising with the temperature, so that at a temperature of 2184° C. the pressure of the confined air will have risen to eight atmospheres. This will occur in whatever way the air may be heated.

If a mixture of 1 cubic foot of London coal gas be made with (say) $5\frac{1}{2}$ cubic feet of air, there is just enough oxygen in the air to combine with the carbon and hydrogen of the coal gas without having either excess of oxygen or excess of the inflammable gas. Such a mixture, when enclosed in a vessel, and ignited, will produce a temperature of close on 2000° C., and the pressure will rise to something like $7\frac{1}{2}$ atmospheres—that is, slightly over 100 lbs. per square inch above atmosphere. This pressure is the highest which can be obtained from a mixture of gas and air at atmospheric pressure. I have proved this by a series of experiments published in 1886. [The lecturer showed and described the apparatus used by him.] Glasgow gas and air, ignited at atmospheric pressure, is some 96 lbs. per square inch above atmosphere; and the maximum pressure obtained with Oldham gas is some 90 lbs. per square inch above atmosphere. In making such a mixture, and introducing it into an engine cylinder, the engineer can feel confident that under no circumstances will the pressures produced within the engine exceed 100 lbs. per square inch.

The earlier engines were constructed on the low-pressure or non-compression principle; that is, the engine was arranged to draw into the cylinder a mixture of gas and air—air from the atmosphere, and gas from a gas-pipe. The communication with the outer atmosphere was cut off at a certain part of the forward stroke; the mixture was fired by the electric spark; and then the piston was driven forward for the rest of the stroke, under the pressure so produced. This type of engine formed for many years the only working engine attempted to be brought into use. It was speedily found, however, that in such an engine the power obtained was very low for the size of the cylinder, and the gas consumption very high. Such engines consumed about 90 cubic feet of London coal gas per hour.

It occurred very early to quite a number of inventors that if a mixture of gas and air were compressed before explosion, higher pressures would be obtained, less heat would be lost to the sides of the cylinder, and greater economies would be realized. This compression idea occurred to one English inventor as far back as 1838; but it remained for a distinguished Frenchman—M. Beau de Rochas—to propose with perfect clearness a practicable cycle of operations enabling the compression idea to be carried out. This he did in a pamphlet published in Paris in 1862. He there stated that to obtain economy with an explosion engine, four conditions are requisite: (1) The greatest possible cylinder volume with the least possible cooling surface; (2) the greatest possible rapidity of explosion; (3) the greatest possible expansion; and (4) the greatest possible pressure at the beginning of the expansion. The sole arrangement capable of satisfying these conditions would, he stated, be found in an engine operating as follows: (1) Suction during an entire outstroke of the piston; (2) compression during the following instroke; (3) ignition at the dead-point, and expansion during the third stroke; and (4) forcing out the burned gases from the cylinder on the fourth and last return stroke.

M. Beau de Rochas did not himself produce a workable engine. To the late Dr. Nicolaus August Otto belongs the merit of making the first successful compression gas-engine. The commercial history of the gas-engine, indeed, may be said to date from the year 1876, when Dr. Otto patented the form of engine now so well known as the Otto type; nearly all the gas-engines at present on the market following what is known as the Otto cycle. At first, the engines built were of small size. In 1878, a 6-horse power Otto engine was considered quite a large one; but gradually, as the difficulties of construction were overcome, the power slowly increased, until now the largest single-cylinder gas-engine in the world develops 1000-horse power if operated by town gas, and 600-horse power when operated by blast-furnace gas.

The Otto cycle engine has thus been wonderfully successful. In this country some 50,000, and on the Continent some 35,000, of these engines have been made and sold. The average power may be taken as about 10-horse; so that not less than 500,000-horse power is now at work in gas-engines in Britain, and not less than 300,000-horse power on the Continent. Including American engines, and the large gas-engines recently built, we may safely consider that at the present moment the gas power of the world is at least 1,000,000-horse power. This estimate includes oil-engines as well as gas-engines; and it is, in my view, somewhat short of the true power.

The stationary gas-engine is used extensively in almost every industry. An interesting inquiry was recently made in Germany, when it was found that, of 2300 gas-engines distributed throughout 36 German towns, 65·6 per cent. of the engines were engaged in the following work: Printing, pumping water, textile manufacture, electric lighting, driving machine shops, joiners' works, cabinet makers' works, butchers' shops, locksmiths' works, coffee roasters, cutlery factories, and lifts or elevators. Of the 65·6 per cent., the printing industry used the greater number; pumping water came next. The remaining 34·4 per cent. of the engines were scattered throughout no less than 140 industries. Practically all these engines are operated on the Otto cycle.

The lecturer then described, by the aid of diagrams, an early form of Otto engine, and proceeded: This type of engine was built by Messrs. Crossley for many years; but year by year certain modifications were introduced, and the pressure of compression very much increased. At the date on which this engine was built, 31 lbs. per square inch above atmosphere was a standard compression. Now, engines of the Otto type use compression of from 90 to 120 lbs. per square inch above atmosphere. An engine using high compressions requires to be modified in certain ways; and though the fundamental principle and operations remain the same, considerable points of mechanical development are found, and there are many points of constructive difference which the experience of years has shown to be desirable, but the great points of departure are to be found in (1) the suppression of the flame slide-valve method of ignition, and the introduction of the incandescent tube igniter; (2) the diminution of the relative volume of the compression space, and thereby the increase of compression; and (3) the improved proportioning of the valves and ports, in order to minimize the throttling of the charge during the inlet period, and the back-pressure of the exhaust gases during discharge. In this particular engine, the compression is not raised to so high a point as in the very latest engines—it having only attained some 50 lbs. per square inch; but in the later engines a pressure of 90 lbs. per square inch is common before ignition. [The lecturer described a Crossley Otto engine of later date than the original one referred to, and also the National, Stockport, and Barker engines, and then passed on to consider the principles followed with regard to the ignition of the charge.]

So far, I have endeavoured to give you some idea of the construction and operation of gas-engines of moderate dimensions. I will now describe very briefly the modifications required for oil-engines, which resemble gas-engines in that the power is generated by the explosion of a compressed inflammable mixture in an engine operating according to the Otto cycle. In the earlier forms of oil-engines, and in those used in motor cars, very light inflammable oils of the gasoline or petrol kind are consumed. Here the problem of vaporizing the oil is comparatively simple. It is only necessary to draw air over a surface saturated with one of these light oils, or throw a jet of light oil into an air current, to produce a mixture of inflammable vapour and air which, when taken into the cylinder, readily supplies the place of coal gas, and gives explosions under compression closely resembling those obtained with coal gas. Of oil-engines of this kind, the most important is, of course, the petrol motor, so largely used on motor vehicles. In connection with this branch of his subject, the lecturer described by diagrams the Daimler, Priestman, Hornsby, and Crossley oil-engines—the first, as the original type of motor-car engine; the second, as a type of oil-spraying engine; the third, as an example of an engine in which the oil is injected into the cylinder, and vaporized therein; and the fourth, as an illustration of the system of vaporizing the oil in a device external to the cylinder, and introduced in a state of vapour. The oil-engine is, he said, at present in the development stage. Large alterations are continually being made, and in a few years great extension may be looked for in the application of oil-engines to industrial purposes.

Before leaving this part of my subject, I wish to refer briefly to one great source of power which is now being developed on the Continent and in this country. I refer to power obtained by the use of blast-furnace gas, and by the employment of gas-producers,

such as Mond's and Dowson's. The largest engines which have yet been made are those which utilize blast-furnace gas. It has been calculated, for example, that if all the gas from the blast-furnaces of the United States of America could be utilized in engines, about 2,000,000-horse power could be continuously produced. On the Continent, quite a number of large gas-engines are now operated by blast-furnace gas. A large engine is running at the works of Messrs. Cockerill, at Seraing, in Belgium. I inspected this engine quite recently, and was much interested in the smoothness and regularity of its operations. This is perhaps the largest single-cylinder gas-engine at present in the world. The diameter of the piston is 51·2 inches, and the stroke is 55·13 inches. The diameter of the piston rod is 9·61 inches; the diameter of the crank-shaft, 18·11 inches. The height of the engine above the ground is 13·1 feet; the length, 36·1 feet; the width, 19·7 feet; and the compression, 135 lbs. per square inch. The total weight of the engine and fly-wheel, without the blower, is 124·9 tons. This engine, running at 90 revolutions per minute, gives 600-brake horse power with blast-furnace gas, and it converts 28 per cent. of all the heat given to it into indicated work in the cylinder. Messrs. Cockerill also have an engine of 1200-horse power, having two explosion cylinders operated tandem fashion. There is in Luxembourg the largest and most powerful gas-engine central station at present in the world. Here nine engines give altogether, with blast-furnace gas, 5400-horse power. Six of the engines are operating blowing cylinders for the blast-furnaces, three of them producing electric light. Other large gas-engines are also at work on the Continent; and on my last visit I found many thousands of horse power of these large engines in course of construction for blast-furnace work. Several large gas-engines are also at work in this country. A large Premier gas-engine of 600-brake horse power is at Messrs. Brunner, Mond, and Co.'s works at Winnington, in Cheshire, driving a dynamo for electrolytic work; and they have another engine, of Messrs. Crossley's construction, of 400-brake horse power. Messrs. Crossley have finished and delivered a large gas-engine to Sir Alfred Hickman's works, near Wolverhampton, for operating with blast-furnace gas. It will, I am informed, give 700-brake horse power.

I have attempted to give you an idea of what is at present being done in gas and oil engines; and I would conclude by saying that great future developments may be expected. So far as economy of heat is concerned, both have considerably surpassed the best steam-engines; but much remains to be done before they equal them in frequency of impulses, in lightness of machinery, and in absolute steadiness of governing—for instance, in power of control, where reversal is required. As yet, the application of gas and oil to any but fixed engines has been very limited; but ultimately, I have no doubt, gas and oil engines will be used with great advantage for propelling ships and driving locomotives. Before gas-engines can, however, be applied to ships or locomotives, it is necessary to depart somewhat largely from the lines of development hitherto followed.

For many years I have advocated the use of high compression, and also the construction of gas-engines more closely resembling the steam-engine than the present Otto cycle gas-engines. So far the Otto cycle engine has triumphed; and it has attained an overwhelming lead in the market. Notwithstanding this, I still retain my belief of twenty-five years ago, that the path of progress in this line must lie through the "impulse for every revolution" engine, and, later on, engines giving two impulses per revolution for a single crank, just like the steam-engine. Many distinguished inventors have agreed with me in considering it necessary to aim not only at an impulse for every revolution in gas-engines, but also at regulating the combustion impulse in the same manner as steam is regulated in a cylinder. Many inventors in Britain have devoted years of their lives to this work, and prominently among them I may mention the name of your distinguished President, Mr. Foulis, who began to give attention to gas-engine problems at almost as early a date as myself. I find Mr. Foulis's first application for a patent in connection with gas-engines was made in 1878; my own first application was at the beginning of 1877.

In my mind, further progress will be on the lines of the combustion engine; and many English inventors have worked on these lines. In 1887, I had an experimental combustion engine of my design running in Birmingham, giving about 7-horse power at 150 revolutions, with great smoothness; and since that time I have continued working on that line. Other inventors have also experimented in the combustion engine line, including Herr Diesel; and there is good hope for believing that in time a constant pressure gas-engine will be produced which can be as easily handled for marine purposes as a steam-engine. At present, of course, there is no possibility of reversing or cutting off power impulse in the way employed in steam-engines. Apart, however, from the engine, further work requires to be done in connection with gas-producers before marine gas-engines become commercially feasible. Both in Germany and in this country, several inventors are at work upon producers intended to use ordinary steam coal, which would furnish gas on board ship without gas-holders, and supply the gas direct to marine or other engines. One great point is to get rid of the present gasholder. Several inventors have made this attempt. Perhaps the first engine of this kind to be run in public was that of Mr. Benier; but recently I inspected at the little suburb of Heusy, near Verviers, a gas plant supplying two 80-horse Otto cycle engines, in which no gas-holder was employed.

In my opinion, the gas-engine affords to the engineer and inventor an enormous field of work, likely to result in a very considerable revolution, certainly in land-engine work as well as in marine work. A gas-engine with an efficient producer would easily give 1 indicated horse power for ½ lb. of coal per hour, as against 1¼ to 1½ lbs. with the best steam-engine now in use; that is to say, power for marine propulsion could be obtained at less than half the present cost. Many engineers are now at work on the subject, and when the problem is further solved, it will aid much in meeting the fuel difficulty, which must face this country at a comparatively early date. My view is that the Nineteenth Century was the century of the steam-engine, and that the Twentieth Century will be the century of the gas-engine. Steam will ultimately be displaced almost entirely by gas-engines.

At the conclusion of the lecture, an interesting discussion took place, the first speaker in which was the President. He dwelt chiefly on his own gas-engine, which he made many years ago. His main trouble in connection with it was the ignition-tube, which grew to be inordinately hot. He also showed several indicator diagrams of the engine, which, however, was never placed on the market. Professor W. H. Watkinson, of the Glasgow Technical College, followed. He said the lecturer had not touched on the Lenoir gas-engine; he would certainly have liked to hear something about that. He subsequently gave some interesting experiences which he had with gas-engines at Sheffield about twenty years ago, having there had intercourse with a Mr. Watson, who had been named by Mr. Clerk as being connected with gas-engine invention, and who had had "churchwarden" pipes to serve as ignition-tubes. Ex-Bailie Burt next spoke, at the request of the President. He said he had had much experience in the making of marketable and successful gas-engines, and he related some of it to the meeting. His chief want was a satisfactory mode of ignition of the gas by which the engine was worked. Mr. F. J. Rowan urged that the lecturer had not given a sufficient account of the large gas-engines used in some Continental iron-works. Professor Archibald Barr referred to the Glasgow Gas Exhibition of some twenty years ago, and said he had on that occasion had the honour and privilege of testing a gas-engine which was then on show. He considered that there were still some points of the best gas-engines on the market which needed improvement, and he congratulated the lecturer on the clear and interesting historical account he had given of the engine. In this respect the Professor was also complimented by most of the other speakers. Professor Andrew Jamieson, late of the Technical College, followed, and said he would give his remarks in writing. He could not, however, help referring to Mr. Foulis's engine, which he had seen in Alley and Maclellan's engine-works in the olden time. He said the ignition-tube of the engine was made of cast iron, and was melted by the extraordinary heat; but Mr. Foulis corrected him on this point. Mr. W. A. Chamen, the Corporation Electrical Engineer, made a few remarks on the subject. Of the ordinary members of the Institution who took part in the discussion, the first was Mr. Robert Williamson, who rather startled those present by what he said about an engine which his firm (Messrs. Potts, Cassel, and Williamson, of Motherwell) had made and erected in their works, and which drove all the machinery. It occupied a space of less than 8 ft. by 4 ft., and did the work remarkably well. In response to the President, he said that the engine was invented by Professor W. T. Rowden, of the Technical College, but originally of the Elswick Institute. Mr. Clerk replied at length to the various speakers, and was eventually awarded a hearty vote of thanks.

Gas from Cork.—According to some particulars given in the "Practicien Industriel," a gas of very high illuminating power, and free from sulphuretted hydrogen, can be extracted from cork. Some of this gas has been tested at the Opera House in Paris, with, it is said, satisfactory results. The residual products of distillation can be utilized for special purposes. The essential oils obtained, having a tannin base, can be employed for the manufacture of paper, pasteboard, impermeable and imputrescible textiles, &c. The carbon residue is very suitable for gunpowder and dynamite.

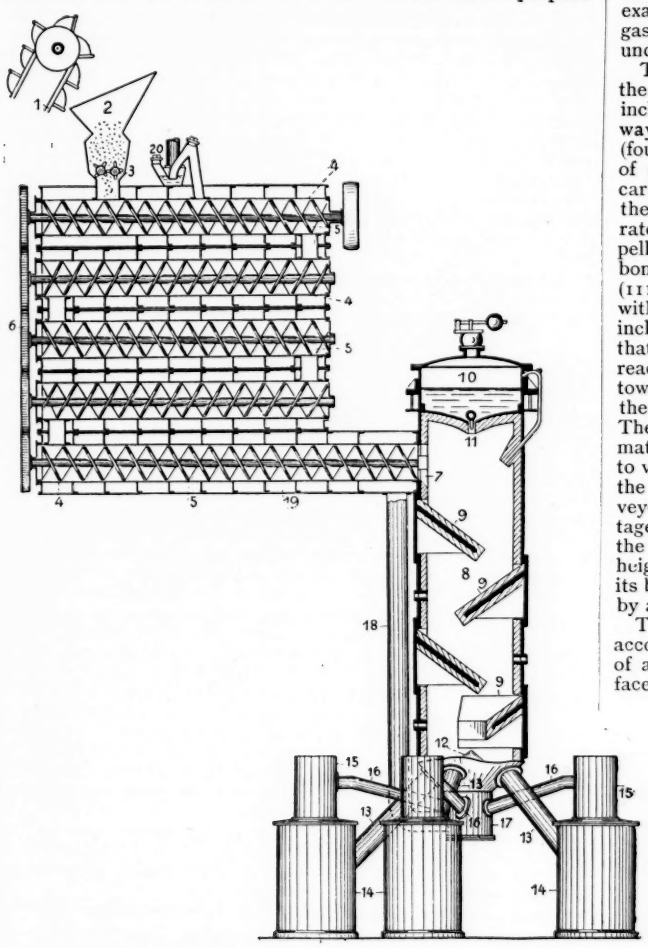
Gas and Electric Power and Textile Factories.—According to the views of Mr. H. W. Morley, recorded in a lecture delivered before the Bradford Textile Society yesterday week, gas and electricity at present do not meet the requirements of textile factories in regard to power. Speaking of gas-engines, the lecturer said that, although engines of the internal combustion type would probably be eventually manufactured sufficiently reliable and cheap to operate textile factories, a great many improvements were yet required to make them suitable for driving spinning or weaving machinery. The method of transmitting power from the engine to the machinery by means of electricity was for textile factories both more costly and less efficient than the usual shafting. It had been suggested that textile factories might be driven by power transmitted electrically from large generating stations placed near collieries; but, owing to the heavy cost of cables, and the loss in conversion from high tension to suitable low tension, it was much cheaper to place the prime power plant on the factory site. In his opinion, it would be a long time before it would be possible to convey electricity as cheaply as coal could be carried.

A CONTINUOUS PROCESS FOR MAKING A MIXED GAS OF UNIFORM COMPOSITION.

(Continued from p. 147.)

A process has been protected in Germany (German patent No. 115,070) which combines carbonization with gas generation. It thus not only fully exhausts the available heating value of the coal, but it also reduces to a minimum dependence on the working staff, and the expenditure on labour.

The features of this process are the passage through a carbonizer of sufficient length of a continuous stream of carbonaceous material, travelling at a determined rate. The material, carbonized gradually during its passage through the carbonizer, is automatically and continuously distributed into a number of water-gas generators. A continuous stream of mixed coal and water gas of uniform composition results, provided there are connected with the carbonizer sufficient water-gas generators to give a continuous stream of water gas. The latter mixes with the coal gas, which, owing to the carbonization being continuous, is of uniform composition. Provision is made for shutting off those generators which, for the time being, are under the air-blast for the purpose



of raising the heat of the fuel, from the supply of coke from the carbonizer. The "blow" gases from the generators are automatically diverted through a general receiver and dust-separator placed beneath the distributing gear, to a pipe by which they are carried away and used externally for heating the carbonizer.

The automatic diversion of the "blow" gases from the water-gas passages is specially useful in preventing contamination of the water gas owing to carelessness on the part of the operators. The change from "run" to "blow," which it is very important for the efficiency of the working, as Dr. Strache has shown,* should take place precisely at the proper time,† is automatically effected. The material under carbonization is in constant movement, and hence always presents fresh and extensive surfaces to the heat entering through the exterior walls of the carbonizer. The most advantageous use of the heat carried off from the generators by the "blow" gases, and by the water gas, is made by applying it thus to heating the carbonizer.

The water-gas generators may be on any system; but in order to maintain proper working automatically and continuously, it is necessary to take into consideration the duration of "run" and "blow," so that a stream of gas may be provided without interruption for heating the carbonizer both internally and externally. The older types of water-gas apparatus had "runs" occupying 15 minutes and "blows" occupying 45 minutes of each hour. The number of these generators required to be attached to the carbonizer, in order to provide a constant stream of "blow" gases for heating it externally, as well as a constant stream of water gas for heating it internally, is given by the following equation:—

$$\text{(I.)}\quad x = \frac{\text{Duration of "blows" (45)} + \text{duration of "runs" (15)}}{\text{Duration of "runs" (15)}}.$$

$$60 \div 15 = 4.$$

The Dellwik type of water-gas generators, in which the "runs" occupy 48 minutes and the "blows" 12 minutes per hour, must, on the other hand, be provided in the number given by the following equation:—

$$\text{(II.)}\quad x = \frac{\text{Duration of "blows" (12)} + \text{duration of "runs" (48)}}{\text{Duration of "blows" (12)}}.$$

$$60 \div 12 = 5.$$

In the first example, there would always be one generator making water gas, and thereby heating the carbonizer internally; while there would always be three generators under the air-blast and engaged in heating the carbonizer externally. In the second example, there would always be four generators making water gas, and heating the carbonizer internally, and one generator under the air-blast and heating the carbonizer externally.

The apparatus is shown in the annexed figure. It comprises the carbonizer, which may be either a long, horizontal, or slightly inclined, cylinder, with heating jacket, rotated slowly in the same way as rotatory cement burners; or several superposed retorts (four in the figure), with conveyors. The choice of these two types of carbonizer depends on the description of coal, &c., to be carbonized, and the space at disposal for the erection of the apparatus. The effective length of the carbonizer, and the rate at which the material undergoing carbonization is propelled, are so proportioned, that finally an almost completely carbonized product is discharged at a temperature of about 600° C (1110° Fahr.) into the tower (8), which connects the carbonizer with the generators. This tower is provided with planes (9) inclined in opposite directions, placed one above the other, so that the carbonized material is shot from them in turn until it reaches the distributor (12). The material is brought in this tower into intimate contact with the water gas entering it below the distributor at a temperature of about 1000° C. (1830° Fahr.) The function of the tower is to complete the carbonization of the material, and thus save the iron carbonizer from being exposed to very high temperatures, as well as to effect the movement of the red-hot material by gravitation instead of by means of a conveyor. For dealing with fine material, the tower may be advantageously filled with a prismatic packing—such as is employed in the Gerstenhofer furnace—in place of the inclined planes. The height of the tower may in that case be lessened. The tower and its baffle plates or filling are made of fireproof material, encased by an iron gas-tight shell.

The distributor may be constructed in either of two ways, according to the duty it has to perform. It may be a segment of a cone, rotated eccentrically, of which the inclined outer surface conducts the material to the water-gas inlet pipes (13), which enter at the outer edge of the base of the tower. The flange of the cone closes the pipe or pipes of the generators which are at the time under the air-blast; or the distributor may be constructed as a concentric cone (12) fixed at the lower part of the tower, so that its inclined upper surface conducts the material simultaneously to all the connecting pipes (13) of the water-gas generators (14). In the latter case, which is not illustrated by the figure, each of the connecting pipes is provided with a separate valve for shutting it out. These valves, and the rest of the reversing arrangements, are actuated, as required, by a ratchet mechanism, which is governed by a clock. A tank (10) is arranged at the top of the tower, for the purpose of receiving the tar (or carburetting material, if the gas has to be enriched) in case this has to be gasified. This disposition of the tank admits of the tar being kept in a freely fluid condition, and being sprayed into the tower in a finely divided state by means of a steam-injector (11). The tar falls on to the stream of incandescent material and is brought into increasingly hotter zones. By blowing in more or less tar, the temperature of the water-gas as it enters the carbonizer retorts can be accurately regulated.

The incandescent fuel passes through the connecting pipes (13) by which the water gas enters the tower (8) into the water-gas generators (14), which are arranged conveniently round about the tower. These generators each have, in addition to the reversing and valve gear connected with the ratchet wheel mechanism, an outlet pipe (15 and 16) for the "blow" gases. These outlet pipes all enter a general dust-separating chamber (17), which is arranged in the middle of the circle of generators, beneath the base of the tower. This chamber can be cleared of the dust, while work is proceeding, by means of double valves on its bottom. The generators have closed ash pits, from which the ashes are removed from time to time.

One general outlet pipe (18) from the dust-separating chamber carries the "blow" gases, which leave the generators at a temperature of about 1000° C. (1830° Fahr.), by the shortest course to the heating jacket of the carbonizer. The gases are diverted

* See "JOURNAL," Vol. LXXVII., pp. 27, 87, 145, 208, 275, and 401.

† See also Professor Lunge's criticism of the Dellwik process, "JOURNAL," Vol. LXXIV., pp. 819 and 1191.

by suitable baffling arrangements, so that they traverse the outside of the carbonizer in a circuitous course before they are discharged into the open. The material undergoing carbonization, owing to its continuous movement forwards, constantly presents fresh surfaces to the external heat; and the iron walls of the carbonizer admit a far more thorough and rapid transfer of the heat than do the thick fire-clay walls of coal-gas retorts, in which the coal remains motionless. It is evident, therefore, that this carbonizer must afford a much better utilization of the heat expended.

The water gas passes first into the connecting pipe or shaft (13), thence into the tower (8), and the carbonizer (4). In the latter, it mixes with the coal gas, and the mixed gas is formed. This escapes through an ordinary water seal (20) to the purifying plant, which is identical with that in common use in gas-works, and so to the place of consumption. Owing to the absolute uniformity of the composition of the gas, a gasholder is only required to meet the fluctuations in demand, and not for mixing purposes. The plant is so constructed that all moving parts are quickly and readily accessible from outside; and it has the reliability in action of a single apparatus. This, indeed, is much enhanced by the way in which the principle of counter-currents is brought into play, as, so long as the apparatus is in action, the temperature remains virtually the same at the same spot. The plant requires only one or two operators, as, apart from the withdrawal of ashes and lubricating and watching the apparatus, everything goes on mechanically, or can be made to do so. The following calculation will indicate the productive capacity and working of this apparatus.

Charlottenburg gas-coke was found to yield 1000 cubic feet of water gas for a consumption of 24½ lbs. of coke, with 1½-minute blows and 7½-minute runs. In order to secure a continuous supply of both water gas and blow gases for heating the carbonizer, the number of generators required would, according to the formula, be $\frac{7{\cdot}5 + 1{\cdot}5}{1{\cdot}5} = 6$. These six generators must all be attached to one carbonizer, which must be capable of supplying coke for the service of them all. Let it be assumed that they are Dellwik generators of the nominal productive capacity of 3500 cubic feet of water gas per hour, and actually making about 4240 cubic feet (120 cubic metres) per hour. For six such generators, the coke consumption per hour will be $6 \times 4{\cdot}240 \times 24{\cdot}5 =$ 630 lbs. nearly. The carbonizer should completely carbonize the coal in three hours—not surprisingly rapid work when the facts that the coal is kept in motion, and that both internal and external heating is provided for, are remembered. The carbonizer must therefore be capable of accommodating the coal equivalent to $3 \times 630 = 1890$, or (say) 1900 lbs. of coke. Assuming that the coal affords 65 per cent. of its weight of coke, the corresponding amount of coal is $1900 \div 0{\cdot}65 = 2925$ lbs. nearly. If a bushel of the coal weighs 64 lbs., and the internal diameter of one of the retorts of the carbonizer is 24 inches, and the coal rests in it at an extreme depth of 8 inches, then the total length of retorts in the carbonizer must be about 69 feet. There may, for instance, be three superposed retorts, each 23 feet in length. These will deliver coke to the tower, whence it passes to the generators.

Now, one apparatus of the size named would yield the following quantity of mixed gas per twenty-four hours, on the assumption—by no means unreasonable, having regard to the extremely favourable carbonizing conditions—that a ton of coal yields 11,840 cubic fect of coal gas. In this case it is assumed that the tar is not converted into gas.

Make of coal gas per twenty-four hours $= \frac{2925}{2240} \times 11{,}840 \times \frac{24}{3} = 123{,}690$ cb. ft.
Make of water gas per twenty-four hours $= 6 \times 4240 \times 24 = 610{,}560$,, ,,
Make of mixed gas ,, ,, ,, 734,250 ,, ,,

Taking the calorific power of the coal gas at about 141½ calories per cubic foot, and that of the water gas at half that value, the calorific power of the mixed gas would be about 85 calories per cubic foot, or ⅗ that of coal gas. Thus, despite the fact that the data on which this calculation is based are taken from the results of the periodic method of gas manufacture, and are therefore unfavourable, it will be seen that the new apparatus gives a quantity of mixed gas every 24 hours equivalent in heating value to $\frac{3 \times 734{,}250}{5}$ = about 440,000 cubic feet of coal gas.

On comparing the heating value so obtained in the product with that obtainable from a Hasse-Didier setting of nine coal-gas retorts, which yield about $9 \times 7060 = 63{,}540$ cubic feet of coal gas in twenty-four hours, it will be seen that the output of the new apparatus is equivalent to that of $\frac{440{,}000}{63{,}540}$ = about 7 Hasse-Didier settings. The wages paid for working these seven settings would amount to about £3 10s. per twenty-four hours (14 men at 5s. each). The settings, with retort-house, &c., would cost about £6250. These figures indicate how great an economy in space, working expenses, capital charges, and coal is to be attained by adopting a continuous process for producing a mixed gas.

(To be continued.)

In their last report, Sir William Crookes and Professor Dewar state that the quality of the London Water Supply last year was, on the whole, excellent; and that the high standard of previous years was well maintained.

NEW CARBURETTED WATER-GAS PLANT AT OLDHAM.

The Oldham Corporation Gas Department have made a substantial addition to their productive power by installing a carburetted water-gas plant of a present capacity of a million cubic feet, and a prospective capacity of 1½ millions. The Contractors were Messrs. Samuel Cutler and Sons, of Millwall; and the manner in which they have executed the work has gained for them very high encomiums from those in authority in this busy Lancashire centre—the Chairman of the Corporation Gas Committee (Alderman George Hanson), for instance, describing the completed plant as "excellent." The only regrettable circumstance connected with the Committee's enterprise is that Mr. John Chadwick, their late Gas Engineer, who planned the plant, did not live to witness its consummation. Mr. Chadwick took a lively interest in this question of the supply of carburetted water gas, and, in a quiet way, investigated very thoroughly the arguments both for and against its adoption as a partner—and an active one, too—of coal-gas plant. The new possession of the Oldham Gas Department is the result.

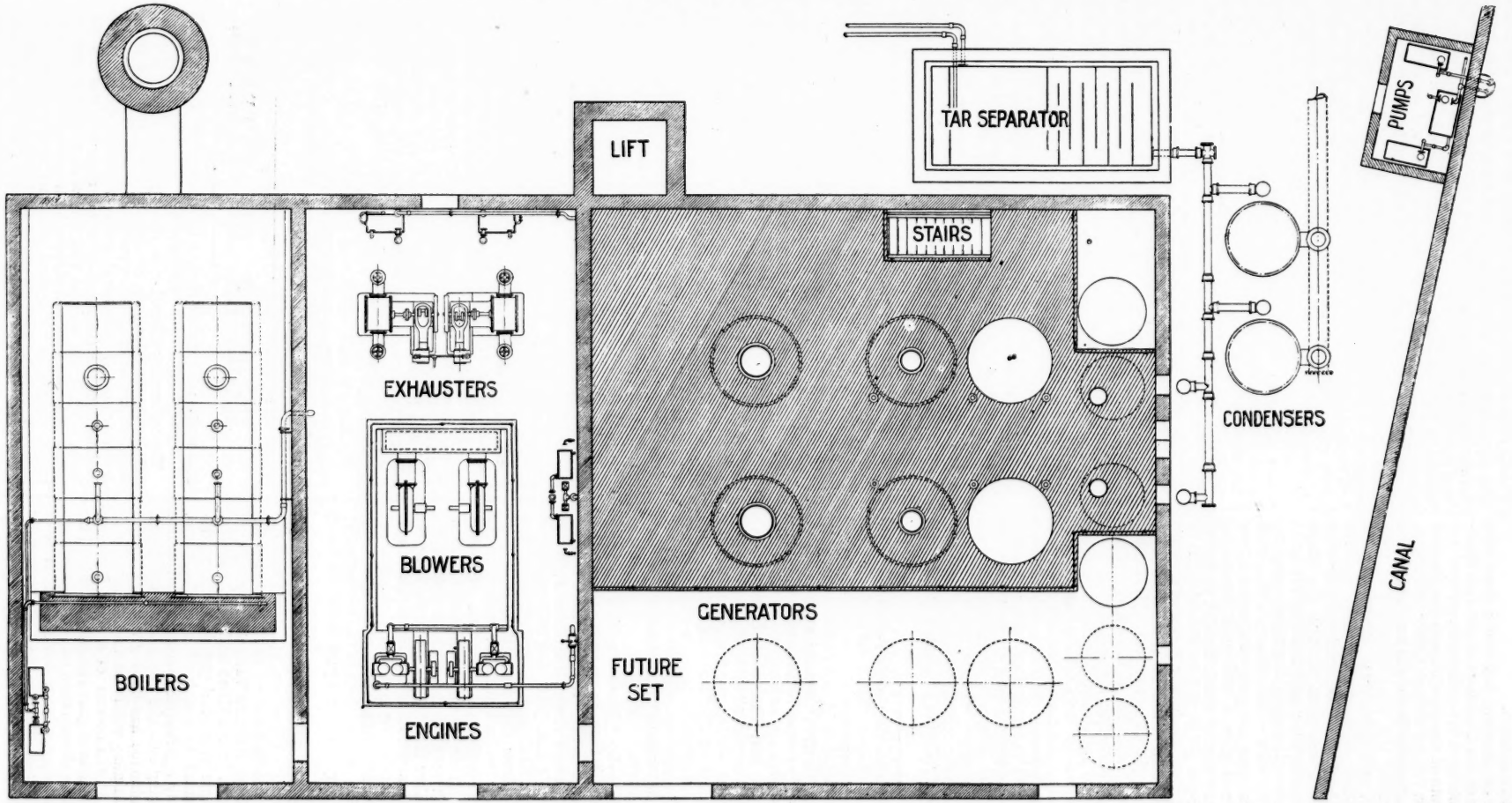
The site chosen for the carburetted water-gas apparatus is at the Hollinwood station; and its situation there will enable it to contribute materially to the economical management of the gas undertaking. Partly owing to the position of the Hollinwood works, and to the fact that they are not directly connected with the railway, coke is not sold to the same advantage there as at either of the other stations of the Corporation; and therefore the water-gas plant will supply a substantial outlet for its immediate and advantageous disposal. Besides this, the greater portion of the coal used at these works has to come by rail, and be carted a considerable distance from the railway; while the oil for carburetting the water gas will be delivered, by way of the canal contiguous to the works, by tank-barges almost alongside the plant. The site on which water-gas is now being made, it may be of interest to mention, was formerly occupied by a coal-gas retort-house, which was demolished in 1880. So changes the old order of things.

The arrangement of the buildings in which the water-gas plant is accommodated and the disposition of the plant itself will be seen from the accompanying plan. We will first generally follow the plant in order, and then subsequently deal with one or two of the special points. The generator-room is about 45 feet square; and the stage-floor is some 16 ft. 3 in. above the ground-floor. It has been designed for three sets of apparatus; each being of 500,000 cubic feet capacity. Only two sets have at present been constructed; the third one being a work for the future, when the demands on the department necessitate its installation. Adjoining the generating-house is the engine-room, which is 45 ft. by 22 ft., and contains the machinery required both for the present and future generating sets. The equipment of the room is all in duplicate. There are two high-speed Tangye engines (of the Archer vertical type), each of 35 brake horse power, and speeded to 300 revolutions per minute. Each drives a Sturtevant fan at 2000 revolutions per minute, and produces an air pressure equal to about 14 inches water column. One of these fans is capable of supplying the air for the whole of the three sets. Then there are two combined engines and exhausters of 50,000 cubic feet per hour capacity, working at 125 revolutions per minute. Duplicate sets of pumps for the water service to the plant, and for the oil supply to the carburettors also find an abode in this room. The steam-pipes throughout are underground, in brick culverts, and are arranged so as to be readily accessible. Adjoining the engine-room, is the boiler-house (45 ft. by 22 ft.), which contains two Lancashire boilers, 7 feet in diameter by 24 feet long, and each capable of evaporating 3400 lbs of water per hour. They have a working pressure of 110 lbs. per square inch.

Coming to the auxiliary plant, there is in connection with the generator room, a hydraulic lift for raising the coke from the ground-floor to the charging stage. The power for this lift is provided by a set of duplex direct-acting pumps, which supply an accumulator weighted to give a pressure of 1500 lbs. per square inch. The lift is furnished with automatic cut-off and self-acting protective gates. Speaking of the coke reminds us that this is loaded direct in the retort-house into the special charging-barrows used for feeding the generators. These are constructed with flanged wheels, and run upon a tramway laid from the retort-house to the lift; and there is thus no unnecessary handling of the fuel. The tramways also extend to the front of the boilers for meeting their fuel requirements. Then outside the buildings, there are two sets of water-tube condensers; and in connection with these, there is a house containing pumps in duplicate, by means of which the water is drawn from the adjacent canal, circulated through the condensers, and returned to the canal—the water being merely used for cooling purposes, and does not become contaminated by contact with the gas at any point. For dealing with the effluents from the washers and scrubbers, Cutler's patent tar-separator has been installed. The oil storage-tank is of 66,000 gallons or about 250 tons capacity. Owing to the exigencies of the site, this tank has been placed on a girder floor over the existing tar and liquor store tanks.

The arrangement for the treatment of the gas in the scrubbers and washers is automatic and very complete. It comprises a cast-iron overhead tank placed on the top of the lift tower, from

PLAN OF THE OLDHAM CARBURETTED WATER-GAS PLANT.



which the water gravitates into the scrubbers and washers, passing through a sight-feed arrangement, by means of which the rate of flow can be readily observed. The outflow from the scrubbers and washers is led to the before-mentioned separator, where the emulsion is properly divided into its component parts of tar and water. The water is withdrawn by means of the circulating water-pumps in the engine-room, and delivered again into the overhead tank for re-use. The tar is removed from the separator as required. Supplementary gas plant includes the relief holder, a set of four purifiers, and a meter, from which point the gas is delivered into the storage holders.

Another special feature of the plant is that it is provided on the superheater shafts with Cutler's patent dust-interceptors, by means of which the coke dust ejected during the blowing is automatically intercepted and conveyed to receptacles within the building. By means of this adjunct to the plant, the possibility of annoyance to residents in proximity to the gas-works is avoided. Similar interceptors, it may interest gas engineers to know, have been fitted to the water-gas plants at Brentford, Folkestone, Harrow, Southend, and Plymouth. The arrangement is in two forms—wet and dry. A description of the former was noticed in our "Register of Patents" some time since;* but the specification for the latter has not yet been published. As soon as it is, we shall notice it.

* See "JOURNAL," Vol. LXXIII., p. 725.

There are several other features about the plant, which tend to efficient and safe working. For example, the air and steam valves are interlocked on Cutler's patent system—the gearing being neatly housed below the charging-floor; and it is impossible, with this contrivance, for the operator to make a mistake in the manipulation of the valves. The value of a system of interlocking of this character is fully recognized by all who have had experience in the working of water-gas plants. Then the oil-feed is by means of Cutler's patent centrifugal sprayers, about which we have heard good report. Again, we find that arrangements are made for slowing the engines down to about 80 revolutions during the process of gas making, in order to economize the steam used. As already mentioned, the site of the plant, being

adjacent to the canal, permits the oil being brought alongside in tank-barges; and special pumps have been provided for delivering inexpensively the oil direct from the barges to the store-tank. This concludes the general description of the new plant, the cost of which has been approximately £15,000.

The plant was inaugurated on Monday last week; those who were present, on the invitation of the Chairman of the Gas Committee (Alderman Hanson), included his colleagues, several representatives of the gas interests of the district, and Mr. Samuel Cutler, and Mr. Samuel Cutler, jun. (of Messrs. Cutler and Sons). Arriving at the Hollinwood station, the party was received by the Chairman, and conducted round the works—inspecting with interest the machinery, plant, and apparatus. Afterwards reassembling on the operating-floor, Alderman Hanson was requested by Mr. Cutler to put the plant into operation by opening the requisite valves. The Chairman went through the entire series of operations for a complete run; and this was repeated again and again under the observation of the assembled company —the whole process proceeding with a smoothness which gave considerable satisfaction. After this, the party descended to the lower floor, when the Chairman gave a lucid and interesting statement of the various circumstances which had led up to the decision to put down a water-gas plant, and to the selection of that constructed by Messrs. Cutler, concluding by expressing his and the Committee's entire satisfaction with the manner in which the whole contract had been completed by the firm. Mr. Cutler, jun., followed with a technical description of the apparatus and the manner of its operation, illustrating his remarks by large diagrams and models; the whole party following his statements with great interest. Enlightened by Mr. Cutler's remarks, the party again made a survey of the plant, and then left the works for the Town Hall, where the Corporation entertained at luncheon all who had been present at the inauguration. After the customary loyal toasts, speeches congratulating all concerned on this successful completion of the enterprise were made by the Chairman and other gentlemen present. One interesting incident during this pleasurable part of the proceedings was the presentation, by the Contractors, to the Chairman of a small souvenir of the occasion.

The "Builder" on the Welsbach Company's Position.—When noticing the results of the proceedings at the recent meeting of the Welsbach Company, our contemporary the "Builder" last week said: "If the English Company is not committed to the purchase of materials from the Austrian Company at prices above their market value, there is every reason to believe that, with the proposed reforms, including a large reduction in the selling price of mantles, the English Company may be converted into a paying concern. In this country about 20 per cent. of the gas-burners in use are incandescents, compared with 90 per cent. in some Continental towns. With the advent of cheap mantles, there is no doubt that the proportion of incandescent burners employed will increase rapidly, and that the number of mantles required for renewals and for replacing flat-flames will necessitate a large increase in the rate of manufacture."

Day Darkness in the City.—In "Symons's Meteorological Magazine" for the current month there is an interesting article on the above subject by Mr. J. E. Clark. The author has recorded the number of quarter hours at which artificial light was necessary between 9 a.m. and 5 p.m. (Saturday afternoons and Sundays excepted) at the Wool Exchange, between October and March, 1897-1901. The tables show that November, December, and January are pre-eminently the dark months; though, on the mean, November is a good deal behind the other two. The only really bad foggy months in the four years were December, 1899, and January, 1901, with which may be compared the prevalent fogs of November and December last. A diagram showing the distribution of dark quarter hours during the day shows a rapid rise between 9 and 10 in the morning, and again about noon. Mr. Clark points out that these anomalies are associated with the lighting of office fires and with preparations in the restaurants; in fact he shows that smoke plays the main part in the darkness during both high and low fogs.

Some Coronation Illumination Gas-Devices.—In connection with the paragraph which appears elsewhere, in reference to the demand for gas that may be looked for on the occasion of the forthcoming Coronation of King Edward VII., we may say that we have received from Messrs. James Milne and Son, Limited, an advance copy of a catalogue of special gas illumination devices which they have prepared in anticipation of the event. The catalogue contains many appropriate designs, and others are in preparation. In glancing over the pages of the catalogue, we notice that special prominence has been given to Imperial devices; some of them containing words certain to meet with the hearty approval of all. In the course of a short introduction, Messrs. Milne state the claims of gas to occupy the first place for the purpose of the outdoor illumination of public buildings. They say that "no method has yet been devised which is at once so effective, and so easy of application, as that secured by the use of gaslight in the form of artistic devices wrought in metal tube, and perforated so as to bring out in living flame fitting emblems of public rejoicing." The catalogue (which contains fifteen pages of illustrations) has on the front cover a photograph of an actual device, showing the gas supply-pipes, and on the back cover a reproduction of a unique photograph of the same device while alight.

PURIFICATION AND STERILIZATION OF WATER.

At the Society of Arts, on Monday last week, Dr. RIDEAL, F.I.C., delivered the second of his course of Cantor Lectures on the above subject. He began by referring to recent legislation having for its object the protection of sources of water supply, and quoted with approval the conclusion of the interim report, issued in July last year, of the Royal Commission on Sewage Disposal, which advises the creation of a new supreme Rivers Authority, who shall have power to take action in cases where a local authority have failed to do so. He suggested that such supreme authority should also have complete jurisdiction over all surface and underground water, and be a Water Board armed with power to determine the prevention of pollution and the standards of purity of potable water, whether belonging to municipalities or private companies. Such authority would thus have power to co-ordinate the work of the different county councils and ensure uniform good quality in public water supplies. He then went on to consider the subject of controlled natural purification. He pointed out that though the Royal Commission had tried to distinguish between natural and artificial processes of sewage purification, no such hard-and-fast line could be drawn. This was specially true in the case of water purification, as storage reservoirs purified by gravity, in the same way as rivers and lakes, and the English sand filters brought about purification by percolation, just as natural waters were purified by their passage through rocks. He showed that the most important criterion in judging of the quality of a water supply was its bacterial purity, and laid stress upon the fact that the typhoid fever death-rate was a very good indication of whether or not a town supply was good. Chemical analysis, he said, was useful in tracing variations in quality; but the actual presence of sewage organisms in a water supply gave positive evidence of contamination. He mentioned that the presence of *B. coli*, spores of *B. enteritidis sporogenes*, *Streptococci*, *Staphylococci*, and bacteria capable of growing at a high temperature, were all significant of drain water and sewage pollution; and their relative frequency in a water supply formed the best evidence of its wholesomeness or otherwise. In reviewing the purification effected by sedimentation in storage reservoirs, Dr. Rideal showed that long storage was not necessary from the purification point of view, as a period of 72 hours was usually sufficient to remove the greater portion of bacteria present in a polluted river water. Large storage reservoirs were, however, necessary when flood water was taken, and in those towns where the consumption was large compared with the normal flow of the river. He advocated shallow reservoirs for storage, and traced the changes which take place in reservoirs which tend to bring about purification.

The remaining portion of the lecture was devoted to a consideration of the effect of sand filters as used in England, and these were contrasted with the mechanical or rapid filters employed in America. Examples were given showing how important it is to ensure that the filter-beds are constantly watched, as even when sand filters are installed as a part of purification works, they are liable to break down and allow impure water to pass to the consumer. Polluted river waters containing more than 100,000 organisms per cubic centimetre cannot, according to Dr. Rideal, be satisfactorily dealt with by even the best sand filters, as the number of organisms left in the effluent will always be high, and above the arbitrary standard of 100 per cubic centimetre suggested by Koch. By combining sand filters with preliminary sedimentation in storage reservoirs, the double purification effected renders most waters apparently safe for drinking, though, even with such safeguard, absolute purity is not ensured. The lecturer mentioned that the Grand Junction Water Company had adopted a system of double filtration which is applied with more or less regularity to the stored river water supplied by the Company, so that in London this danger is being slowly attended to.

The third lecture, which was delivered last night, was devoted mainly to mechanical and thermal purification. In his concluding lecture for next Monday, Dr. Rideal will deal with the chemical purification of water.

REGISTER OF PATENTS.

Carburettors for Motive Purposes.—Purves, W. T., and the Notkin Syndicate, Limited, of Edinburgh. No. 239; Jan. 3, 1901.

The carburettor referred to is rectangular in shape, divided vertically by the partition into two halves. The perforated partition B forms a chamber at the front end from which the gas is drawn out. A further shelf or partition C traverses each of the two halves horizontally from the front end to within a short distance of the back. From fig. 2, it will be seen that the front of the carburettor is provided with two independent hit-and-miss valves D E, which admit of the air passing into the small chambers B^1 B^2, whence it is distributed through the perforations in the partition B. In the front of the carburettor are also the two valve-ways F G, which form the communication between the alternate upper and lower opposite chambers. Thus F forms a passage between the upper left-hand compartment and the lower right-hand one; while G connects the upper right-hand with the lower left-hand compartment. These valve-ways are provided with simple closing and opening devices or throttles, as shown in fig. 4. The valve-way F (in front of the front plate) is of

U-shape; while the valve-way G is simply tubular—in other words, open at both ends. From the lower division of the carburettor come the two gas-pipes H I, which unite in the three-way cock J, which, in turn, leads to the meter by the gas-pipe K. Filling holes L M are provided on the top of the carburettor.

Fig. 1.

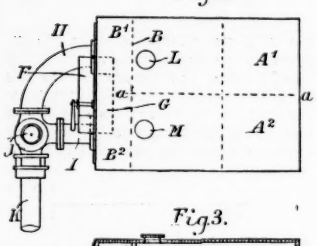


Fig. 2.

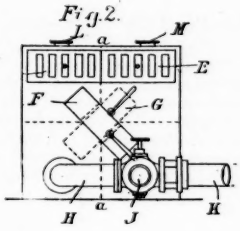


Fig. 3.

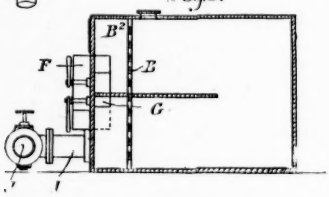
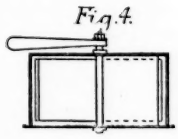


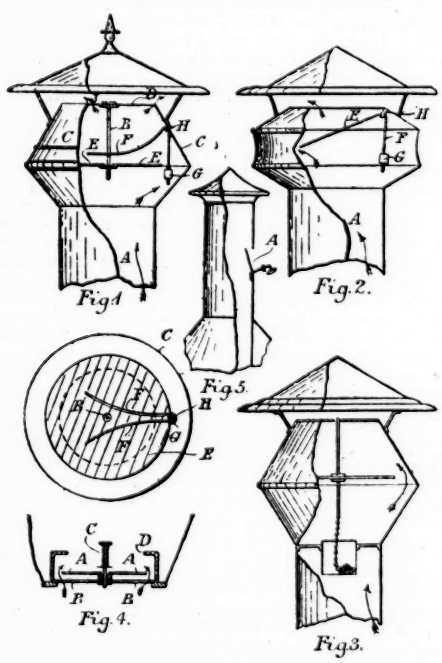
Fig. 4.



With such a carburettor, either half—A1 or A2—can be used independently as desired; or, if two separate cocks are provided, both halves can be used together by closing the valve-ways F G. Further, if desired, the valve D can be closed; air be drawn in through E; and the valve G and the pipe I be closed by means of the three-way cock. The air taken in at E will now have to pass backwards along the upper half of the side A2, round the end of the shelf C, and forward again to the front below C, where it will pass upwards through the valve way F, which is open, into the upper half of A1, backwards and round the shelf C, and again along to the front, when it will finally escape through H, J, and K. The air will thus pass through all four compartments, and will have taken up the maximum amount of hydrocarbon vapour.

Street-Lanterns.—Simmance, J. F., and Abady, J., of Page Street, Westminster. No. 358; Jan. 7, 1901.

In their specification, the patentees remark: "As the light yielded by gas-flames in street-lanterns is subject to fluctuation by reason of changes in the amount of air carried through the lantern—and which changes are largely due to the aspirating effect of the wind on the outlet duct of the lamp—they propose to provide means by which a constant passage of air, larger or smaller as may be desired, can be obtained. The difference of temperature between the products of combustion and the external atmosphere (modified by the available dimensions and shape of the outcast shaft) fix the minimum extraction; but a strong wind passing over the outlet will cause this amount to be largely exceeded, with, in many cases, "a lessening of the light of the burner, or frequently deteriorative effects on mantles and the like."



They propose, therefore, to construct the lantern so as to pass an amount of air which will give the highest possible effect in light from the burner and from the amount of gas used, and prevent the quantity of air being exceeded by a valve, at the outlet, of the disc or flap variety, placed at a suitable enlarged portion of the outcast shaft, so that it does not restrict the full working area of the shaft. It must, however, be so near to the point of retraction of the shaft that, should the speed of the air current up the flue be accelerated, the valve will rise. To prevent its closing entirely, and stopping all exit, there is attached to the valve (or placed in such a position as to be impacted upon by the valve in rising) the arm of a lever, to which is rigidly attached a vertically pendant weight so disposed that it will be easily moved from its position at first; bnt on the lever being still pressed by this valve (seeking to shut), the weight will be gradually raised toward the horizontal. Thus its tendency to hold down the valve becomes greater as the valve nears its seating; and the greater the power of the ascending current to close the valve, the greater the effect of the weighted lever.

In fig. 1, A is the shaft by which the products issue from the lantern. B is a wire rod supported centrally in an enlargement C of the shaft (which enlargement is of such dimensions that the area of passage round the disc E when at rest equals that of the shaft A) by means of a support D. E is a talc disc, which runs upon the pin B. F is a double arm (preferably of wire), bent so as to form an impact surface for the disc E, and a stem for the weight G. It is carried by a loop H—the double arms dividing at H and passing on either side of the rod B. The products rise by the upshaft A, normally pass round the disc E (which is in its lowest position), and flow freely away through the opening J. Should the speed of the products, however, become unduly accelerated, the disc E will rise and partially close the outlet, lifting the arms F, and swinging in the weight G more and more (so retarding its own lift). Thus the nearer the disc approaches the vortex of the products' outlet J, the greater will be the influence of G. The passage of products is by these means restricted to the speed at which the disc E may remain at rest. Any increase lessens the outlet in proportion, and checks the flow.

Fig. 2 shows a disc E hinged at one part of its edge H and weighted at G, adjustably, on the screw stem F. Its action is similar to fig. 1. Fig. 3 is a disc mounted rigidly on a spindle (free to move vertically), to the lower end of which is attached a series of connected weights, which have the same effect as the weights G in figs. 1 and 2. Fig. 4 shows a valve acting upon the air-inlet. A is a disc-valve controlling the opening B; and C is a light coiled spring. Any undue aspiration upon the products shaft will lift the valve from its normal position (which is such as to allow the normally required air passage past it), and so partially close the inlet at D until the air-passage is lessened. Fig. 5 shows a flap A fitted in the exhaust-shaft itself. Obviously, an abnormal exhaust will lessen the atmospheric pressure within the lantern, and so cause the hinged and counterbalanced valve to open and relieve the passage through the lantern.

Price-Changers for Prepayment Gas-Meters.—Parkinson and W. & B. Cowan, Limited, and Cheshire, W., of Moseley, Birmingham. No. 2801; Feb. 9, 1901.

This invention refers to a locking and sealing device for the price-changing or rate-changing appliances or attachments used in connection with prepayment gas meters—particularly of the scale type. Additional security is given to the sealing means by the substitution of lead for waxen seals; the lead seal being placed within the interior of the appliance, and so arranged as to be accessible only when the padlock of the ordinary cash-box is unfastened.

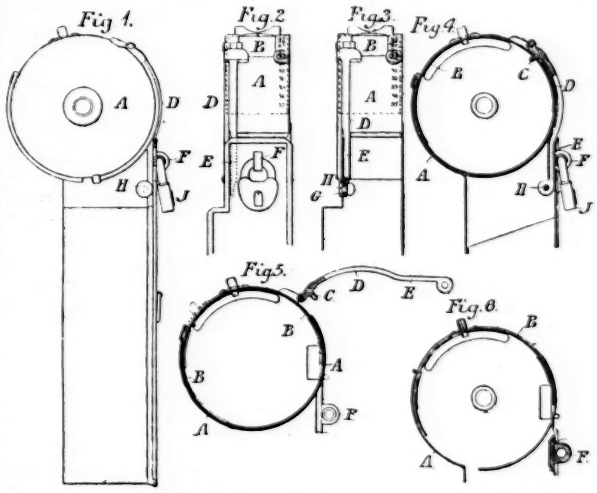


Fig. 1 represents a price changer attachment in accordance with this invention for locking the adjustable price-changing drum, sealing the locking mechanism, and protecting the seal from tampering or clandestine interference by unauthorized persons. Fig. 2 is a front elevation of the attachment, showing the padlocked door, which carries and encloses the cash-drawer, and covers up the internally-located sealing devise employed in connection with the drum-locking mechanism. Fig. 3 shows the door and cash-drawer removed, so as to exhibit the disposition of the seal which fastens the drum-locking strap. Fig. 4 shows the drawer and cash-drawer removed, and the drum-locking strap swung up into the position in which it is placed when the rate-changing drum is released for re-adjustment. Fig. 6 is another vertical section of the attachment.

The rate-changer represented is of the same construction as an ordinary scale attachment, and comprises the usual adjustable rate or price-drum B and fixed casing A; the former having the ordinary coin slot, while the edge at one side is marked with a scale of numbers or figures indicating various numbers of feet of gas to be supplied for every coin inserted. This edge of the drum is overlapped by a flange of the fixed casing, having a view hole through which a figure representing the rate of supply for the time being is visible; while the other side of the drum is pierced with a series of holes arranged opposite to, and corresponding with, the numbers of the graduated scale, into one or

other of which holes a peg C, carried by a hinged and swung-back strap D, pivoted to one side of the fixed casing engages, and so locks the price-changing drum in any position to which it may have been adjusted for determining the amount or number of cubic feet of gas to be delivered in exchange for the coin.

The top of the fixed casing has a gap or opening corresponding to the range of movement provided for the drum for setting the mechanism to the various rates of delivery within the range of the apparatus; and through this gap, the mouthpiece of the coin slot extends, while the series of holes wherewith the locking peg engages, is covered up or overlapped and concealed by a cover flange having a single gap or clearance under which the particular hole to be engaged by the peg is brought by the partial rotation of the drum for adjustment. When the strap is turned down, the peg passes both through this clearance in the flange and into the holes of the series which has been brought coincident therewith.

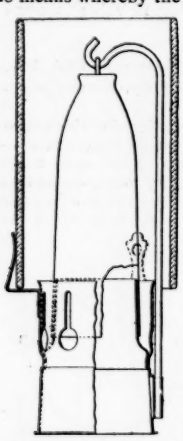
The strap is made to conform to the contour of the drum, and its lower end is provided with an arm or extension E, adapted to fit within a sinking or seating formed in the front of the casing, at one side of a fixed padlock staple F; while the extremity of the arm has an eye adapted to be brought coincident with a hole G in the side of the casing, through both of which holes a lead sealing pellet H is passed. Then the ends are "headed" by means of a suitable tool.

As a further security against interference with the rate-changing mechanism, the front or door of the removable cash-box or drawer I, which fits within a box-like extension depending from the bottom of the casing, and is provided with a hole to take over the fixed padlock staple previously referred to, is arranged to enclose the sealed extension of the drum-locking strap and the sealing rivet, so that, in order to obtain access to the seal for releasing the strap and altering the price-changer, a person would have to first unlock the padlock J and draw out the cash-box before the lead seal could be destroyed.

When the price-changer requires to be re-set, the authorized person unlocks and withdraws the cash-box, destroys the seal, and raises the hinged strap, when the stud on its inner side is disengaged from the hole in the changing drum, and the latter is re-adjusted as desired.

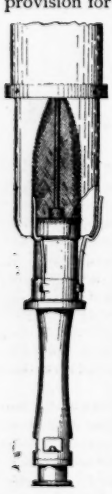
Incandescent Gas-Burners.—Falk, Stadelmann, and Co., and Thurnauer, L., of Farringdon Road, E.C. No. 4159; Feb. 26, 1901.

This improvement in incandescent burners of the Kern type relates to means whereby the mantle can be removed from the burner body without risk of damage, and also to protect the fringe of the mantle against damage caused by swaying. The mantle is suspended from a support fixed to a device comprising an inner tube adapted to fit upon the conical burner-head, and an outer jacket; the latter being arranged so that a space is left between the tube and the jacket. The outer jacket is provided with slots for the admission of air, and at its lower part with holes to enable the mantle to be burnt off from below. The mantle carrier is also made to take a glass globe to serve as a protection for the mantle when used in street-lanterns or in exposed positions. To this end, prongs are fitted to the upper part of the device; the prongs being adapted to carry the protective glass, and also being advantageously provided in their horizontal portions with holes adapted to serve as guides for the outer bye pass supply-pipe, where one is used—thus preventing damage to the mantle by the pipe. With this arrangement, when it is desired to remove the mantle, the device is merely lifted from the burner-head, carrying with it the mantle and protective glass (if used), which can thus be placed aside safely while the burner-fittings are being cleaned.



Incandescent Gas-Burners.—Brett, C. G., of Finsbury Park, N., and Henneberger, F., of Pimlico, S.W. No, 4228; Feb. 27, 1901.

This burner (of the incandescent type) is suggested to "give a high efficiency with the use of a mantle of moderate size, without any special provision for increasing the pressure of the gas."



The burner-tube is of double truncated form, and of a size which will provide for the passage of a large volume of gas; but, in lieu of using a burner-head of a size which would be suitable for the consumption of what with the Kern burner is called the self burning mixture, it is somewhat reduced in diameter, and a flame is in this way produced which requires for complete combustion a supply of air outside the flame.

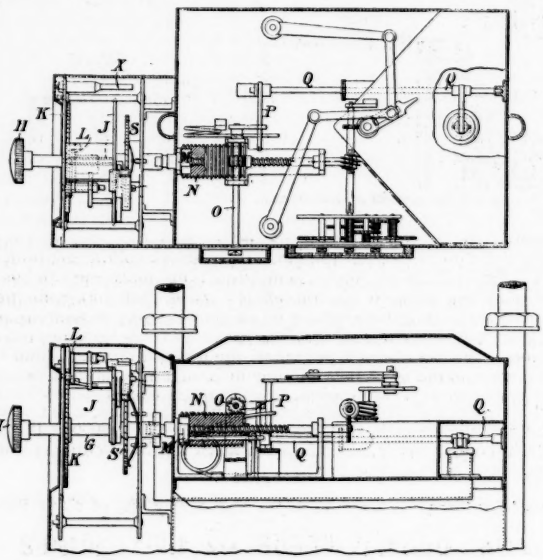
In order to provide this additional air, and at the same time to so form the flame that it will assume a coned shape corresponding to the contour of the mantle, a tall chimney is used, open at the bottom and top, and somewhat closely surrounding the flame. The chimney is supported by a skeleton frame, allowing free admission of air to its bottom; and in practice the patentees find it is necessary that the lower edge of the chimney should be somewhat below the level of the upper edge of the burner-head. The chimney is usually constructed of a metal or china upper part with glass below. The exact position of the bottom of the chimney may slightly vary; but it has been found by experiment that, if the bottom of the chimney is raised above the level of the burner-top, the flame, instead of assuming a shape corresponding to that of the mantle, becomes pointed, and so the efficiency of the lamp is much reduced.

Gas-Fires.—Richmond, E. W. T., and Thornton, H. M., of Stratford. No. 4432; March 1, 1901.

This invention consists in hingeing the front metal casing to the main body of a gas-fire, and constructing the fire-brick body in such a way that it can be slipped into and out of place from the front when the metal front is opened; also in hingeing the side framings or panels to the main body, so that the tiles can be readily got at for repair or alteration. The arrangement was sufficiently described and illustrated in the "JOURNAL" for Nov. 5 last, p. 1170.

Coin-Freed Gas-Meter.—Cox, W., of Battersea, S.W. No. 10,691; May 23, 1901.

This coin-freed apparatus for use with gas-meters provides means for controlling the opening and closing of the gas admission valve by an operative connection with a handle under the control of the gas purchaser. The handle is connected through its spindle with a coin-carrier, and with an arm pivotally supporting a driving pawl adapted to engage with a ratchet-wheel, and yieldingly retained by a spring in either of two positions—*i.e.*, in engagement with the ratchet-wheel or disengaged therefrom.



As shown, there is a casing for the meter, and an auxiliary casing for the coin-mechanism. An opening in the latter casing exposes the central plate, which has a slot in it for the insertion of a coin. A spindle G, having an external handle H, bears a coin-pocket J and a ratchet-wheel K, with which engages a retaining-pawl, so as to allow the spindle to rotate in one direction only. The coin-pocket is open at the side next to the central plate, to permit the insertion of a coin; a corresponding slot being formed in the ratchet-wheel. The coin-pocket is also open at its outer end—*i.e.*, the end furthest from the spindle G—so as to enable the coin to fall out.

The spindle G also bears an arm in the form of a plate M, to which is pivoted a pawl having an arm formed with two notches, into one or other of which engages a spring pressed projection, so as to hold the pawl either in or out of engagement with the ratchet-wheel S mounted co-axially with the spindle G, and connected to the quantity-mechanism of the meter. The pawl is moved into engagement with the ratchet-wheel S by means of a striking arm or pin on a lever, which, when acted upon by a coin in the coin-pocket J, causes the pin to act on an extension of the pawl for this purpose. The pawl is moved out of engagement with the ratchet-wheel by means of a second striking arm or rod X, which can be secured in one or other of a series of holes in the central plate by means of a nut, so that the pawl remains in engagement with the ratchet-wheel S during a greater or less portion of each revolution of the spindle G, accordingly as the amount of gas to be supplied per coin increases or diminishes. After acting on the lever, the coin drops out of the coin-pocket J into a money-box, as the pocket approaches its inverted position in the rotation of the spindle G.

In order to ensure that, after each operation of the mechanism, the coin-pocket shall come to rest with its lateral opening opposite to the outer slot, a lever L is pivoted to the central plate, and the path of a pin on the ratchet-wheel K is extended so as to arrest the motion of the spindle G and coin-pocket J when the lateral opening of the coin-pocket registers with the outer slot E. The coin-pocket and connected parts are released by the next coin inserted, which acts on an inclined extension of the lever L, and raises the lever out of engagement with the pin. The extension also prevents a coin which has failed to drop out of the coin-pocket from actuating the lever a second time—such a coin coming into engagement with the extension, and preventing the coin-pocket from being again moved into registration with the outer slot until the coin has been removed, which can only be done by a person having access to the interior of the casing. While the coin is stopped by the extension, the outer coin-slot is closed by the ratchet-wheel, which fits closely up against the central plate, so that there is no risk of the extension being raised by a wire inserted through the coin-slot. By this means, "attempted frauds by the use of coins covered with adhesive material can be detected."

The ratchet-wheel S is fixed to a spindle arranged co-axially with the spindle G, but capable of rotating independently of it; the motion of the spindle being damped by a spring bearing against the ratchet-wheel S, so as to prevent it from over-running or being turned by the spindle G when the pawl is out of engagement with the ratchet-wheel. The spindle is made in two detachable parts, to facilitate dismounting the apparatus, and bears at its other end a crank-arm M, to which is secured a crank-pin adapted to slide into an eccentric hole or socket in the nut N. This nut turns on a screw-threaded spindle, which can

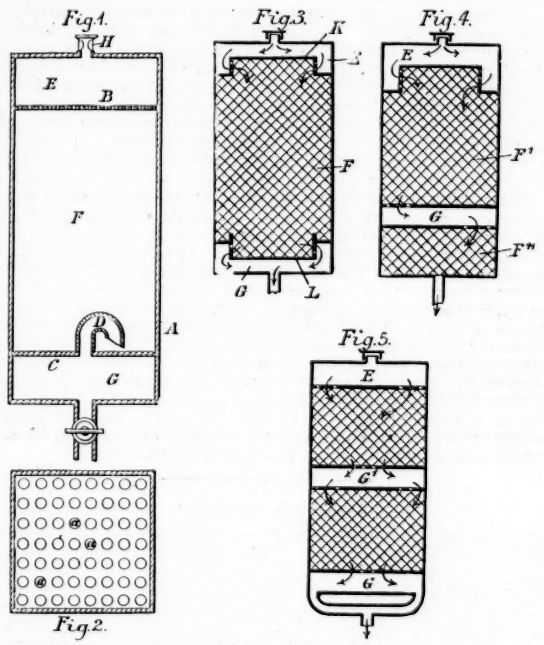
rotate independently of the other spindle, and is driven through worm gearing from the rotary arbor of the meter, so as to return the nut N to its original position after being displaced by the action of a coin. The nut is provided on its exterior with a circular rack which engages with a pinion on a transverse shaft O, one end of which bears a pointer moving over a dial graduated to show the amount of gas prepaid at any moment. The other end bears a lever arm adapted, when the nut is at one end of its travel, to bear on an arm P on a horizontal rock-shaft Q passing through a stuffing-box in the "bridge" of the meter, and thereby shut off the gas by means of a valve pivotally-mounted on a second arm on the rock-shaft. The latter valve is opened automatically by a spring acting, for example, on the arm, when the other arm is raised.

Automatic Carburettors.—Purves, W. T., and the Notkin Syndicate, Limited, of Edinburgh. No. 21,519; Nov. 28, 1901.

This is an improvement in the type of carburettor described in patent No. 20,667 of 1895.

In figs. 1 and 2, A is the carburettor, which has two diaphragms or partitions B C. The upper partition B is perforated with holes; while C has let into it the syphon-pipe D, whereby the gas is drawn off. The carburettor is thus divided into three compartments E, F, G. The upper one E is an empty (air) chamber; and it has an air inlet H at the top. The lower (gas) compartment G is connected with the syphon-pipe D, and has also a gas outlet pipe. The central compartment F is filled with absorbent material, so as to hold in suspension the liquid hydrocarbon, as in an ordinary carburettor.

When the air inlet and gas outlet are open, air passes into the chamber E, and is distributed over the surface of the partition B. Through the orifices of this partition, the air flows into the central chamber F, where it takes up hydrocarbon vapour. As it does so, it becomes heavier and descends. In its descent, it comes into contact with fresh surfaces of impregnated absorbing material—becoming gradually heavier as it does so until it reaches the bottom of the charged chamber. Here it is drawn through the syphon tube D into the chamber G, which is filled before the gas or carburetted air passes



downwards through the gas outlet. The function of the gas-chamber is to give a steadier supply of gas, through acting as a more plentiful reserve space for the gas. "It further enables the apparatus to withstand concussion and vibration to a very considerable degree without affecting the steadiness of the light at the burners, or the supply of gas for other purposes."

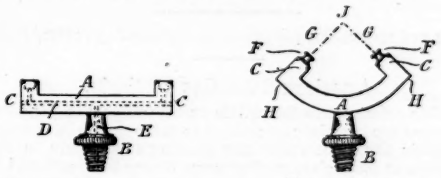
Such a carburettor—that is, having a gas-chamber or a gas-chamber and an air-chamber in connection with the charged chamber—is termed by the patentees a "steadying carburettor." In figs. 3, 4, and 5 modified forms of the carburettor are shown. In fig. 3 the carburettor differs but little from that shown in fig. 1. The charged chamber has a neck K projecting upwards into the air-chamber, and a neck L projecting downwards into the gas chamber. The orifices through which the air passes into the charged chamber and into the gas-chamber are placed at the sides of the necks—the air passing in the direction shown by the arrows.

In these "steadying carburettors," the gas-chamber is placed below the charged chamber; but it may be placed so as to separate the charged chamber into two parts. This will be seen in fig. 4, where it is shown as separating the charged chamber into two parts F1 F11. The course of the air is indicated by the arrows.

Nor is it necessary that there be only one gas-chamber. In fig. 5, two gas-chambers are shown—one of these (G1) being an intermediate gas-chamber of the kind illustrated in fig. 4.

Acetylene-Burner.—Bray, J. W., of Leeds. No. 22,105; Nov. 2, 1901.

The type of acetylene-burner upon which this is an improvement is the bunsen, made for a single jet of flame or two or more separate jets which form one flat flame. There are separate orifices for each jet of gas, and air-inlets in the form of slits or holes (so that there passes along with the gas to the point of ignition a more or less quantity of atmospheric air, after the manner of the well-known bunsen burner) at any angle to the gas-orifice, and of any number.



As shown, the burner consists of a square or like sectioned bar A, with a circular nipple B in the centre screwed for the gas-fitting, and at each end a projection C. A small hole D is bored longitudinally through the bar for its entire length; and the two ends of the hole are plugged up. A hole E is also bored through the nipple B terminating in D. In each projection C, a hole is bored communicating with D—thus forming a channel between the circular nipple B and burner-tips F. The bar is afterwards curved in such a manner that the fine jets G of acetylene gas issuing from the tips are at, or about, right angles to each other. The gas-jets must strike each other at J, to form a satisfactory flat flame, and afford a requisite amount of light.

In constructing burners of this class with circular sections of the bar A, the patentee points out that he has found considerable difficulty in getting the two fine streams of gas issuing from the burner tips to strike each other at the point of intersection J; and in order to be enabled to readily adjust the burners so that the two streams will strike each other at the desired point, the outer surfaces of the projections C are continued in the same plane to H at the under side of the bar—thereby affording provision by which, on the application of levers, similar to screw keys made to engage with the sides of each end-projection C, the latter may be readily "set" so that the stream of gas flowing through each centre-opening in the burner-tips will strike each other at the point of intersection J, and thereby secure the production of a satisfactory amount of light.

APPLICATIONS FOR LETTERS PATENT.

368—Wise, W. L., "Discharging retorts." A communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. Jan. 6.

419.—Owensmith, W. H., "Fastening for doors of lamps." Jan 7.

454.—Crease, J. F., "Incandescent mantles." Jan. 7.

484.—Davies, P., and the Hydroleum Company, Ltd., "Separation of undesirable matter from carburetted water-gas or analogous tars." Jan. 7

542.—Brown, J., and Dunbar, J., "Prepayment gas-meters." Jan. 8.

586.—Wise, W. L., "Quenching or cooling coke." A communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. Jan. 8.

618.—Napier, J. L., "Gas and oil engines." Jan 9.

678.—Baedeker, E., "Lamps." A communication from E. J. Arnold. Jan. 9.

770.—Siemens, F., "Regenerative gas-furnaces." Jan. 10.

791.—Wise, W. L. "Charging retorts." A communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. Jan. 10.

795.—Roberts, J., "Gas-meters." Jan. 10.

852.—Wise, W. L., "Working of gas retorts." A communication from the Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz. Jan. 11.

886.—Rausch, G. J., "Manufacture of acetylene gas." Jan. 13.

887.—Müller, H. F., "Acetylene generator." Jan. 13.

909.—Simms, F. R., "Internal combustion engines." Jan. 13.

937.—Graydon, J. W., "Turbines or impact wheels propelled by gas or the like." Jan. 13.

951.—Lewis, W. W., "Acetylene generators." Jan. 14.

986.—Newton, J., "Incandescent gas lamps and fittings." Jan. 14.

1039.—Thompson, W. P., "Lighting devices." A communication from B. S. Philbrook. Jan. 14.

1040.—Kennedy, W., "Manufacturing coke." Jan. 14.

1049.—Bradshaw-Jack, T., "Production and storage of acetylene gas." Jan 14.

1062.—Zoelly, H., "Steam or gas turbines." Jan. 14.

1084.—Rowe, J., "Incandescent mantle suspender." Jan. 15.

1143.—Johnson, A., and Hirsch, G. H., "Anti-vibration gas-fittings." Jan. 15.

1157.—Liversedge, A. J., "Lanterns for street and other lamps." Jan. 16.

1164.—Paterson, M., "Acetylene gas generators." Jan. 16.

1247-8.—Hildebrand, H., and Ihle, G., "Explosion Motors." Jan. 16.

1250.—Zoelly, H., "Steam or gas turbines." Jan. 16.

1255.—Harry, G. A., "Air combination gas-chimney." Jan. 17.

1292.—Dewhirst, C. H., "Internal combustion engines." Jan. 17.

1312.—Bennett, J. F., Moorwood, H. S., and Rucker, M. D., "Treatment of gases for motors, heating, illuminating, and other purposes." Jan. 17.

1387—Joly, C., "Rotary engines for obtaining power from steam and other fluids." Jan. 18.

1392.—Long, G., "Appliance for removing incandescent mantles from burners and replacing them in position." Jan 18.

1397.—Marshall, H., "Carburetting air or gas." Jan. 18.

1415.—Bourcart, J. J., "Motors using explosive gases." Jan. 18.

Bradford Gas Bill and the Out-Townships.—The Bingley Urban District Council have instructed their Clerk to write to the Bradford City Council and inform them that the Bingley Council would acquire the portion of the undertaking of the Clayton, Allerton, and Thornton Gas Company which is situated in their district; and that in certain events the Bingley Council would oppose the Bill by which Bradford are seeking power to purchase the Company's works.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

American Fuel-Gas Methods.

SIR,—With reference to the article on this subject in your last issue, the Americans are certainly beginning to make a step in this direction, and with their usual enterprise are pushing their trade in England. But, in justice to English manufacturers, it may be mentioned that the business is a well-established one in this country. We ourselves have supplied many furnaces to the Royal Mint, and have at the present time further orders in course of execution. It is evidently not at all necessary for the English Mint to obtain their furnaces from America. A curious coincidence occurs at the moment of writing, when we receive an inquiry for furnaces from the Chilian Government, on the recommendation of the Royal Mint, London. What is still more to the point, we make the furnaces for the Assayers to the Royal Mint, the Bank of England, the Assay Offices of Birmingham, Chester, and many others, from some of which American furnaces have been removed and replaced by ours.

It is, of course, natural that American furnace-makers should use a cheap American fuel, which, spite of statements to the contrary, is very strongly objected to as dangerous by English Fire Insurance Offices. We ourselves are only permitted to keep a very small quantity on the premises. On the other hand, our furnaces and workshop appliances are equally well suited for coal gas, natural gas, producer and water-gas, gasoline, benzoline, and ordinary kerosene or petroleum oil—a result obtained up to the present by no firm except ourselves. Many of our high-temperature furnaces are entirely automatic, using ordinary petroleum oil. They require neither blower nor blowing power; and a glance at our list, as compared with any American furnace list, or with the lists of all the American makers put together, will show at once the very meagre range of work possible with the American appliances as compared with our own.

For the last thirty years, we may safely say we have been unapproached in furnaces and workshop apparatus for gaseous fuel, and our current list shows clearly that we can hold our position.

With regard to gas-producers, the automatic petroleum furnaces make their own gas as required; and for general use we have for nearly thirty years past, made an automatic gas-producer using the lighter petroleum, which is safe, cheap, portable, requires no gas-holder, and costs fewer shillings for the same power, than the cheapest American costs pounds. It produces the gas precisely as required, and can be used for lighting, gas-engines, furnaces, blowpipes, and practically every required purpose. Finally, as regards simplicity, lowness of cost, speed of heating, and general adaptability, those who know the different makes, and know how to use them, are quite competent to judge. The existence of such a list as we publish is sufficient to show that the use of gaseous fuel in workshops, &c., is a very important business, and one, we are pleased to say, which grows by direct recommendation, as the users know what they want, and are not misled by specious advertisements. A business of this class requires long experience to establish, and until recently the gas companies have failed to see the certain enormous day-demand from this source. Fortunately, some few at last perceive its value; and are taking the matter in hand in earnest. The advantages are: Large day consumption, small cost of apparatus, no hiring, supervision, or risk in any way, and a perfectly steady winter and summer consumption, which drops only on Sundays and public holidays.

The American furnace makers have two enormous advantages over all English makers. They keep English goods out of their country by a prohibitive duty, sending their goods here free; and they are a nice long distance away when difficulties arise, as they do in new and untried processes and methods.

THOS. FLETCHER, F.C.S.

Warrington, Jan. 23, 1902.

The Trend of Gas Invention.

SIR,—In the article under the above heading, it is stated, *re* inclined retorts: "We have left Continental practice far behind in the latter regard." This is a very definite statement; and I beg leave to challenge it. Will the writer kindly indicate in which direction Continental practice has been left far behind?

F. D. MARSHALL.

Copenhagen, Jan. 23, 1902.

[As the writer of the article on the "Trend of Gas Invention" sits down to reply to our respected correspondent, his eyes rest on a framed cartoon, at the foot of which a skilled operator of a pen has printed the words, "For in spite of all temptations, to belong to other nations, he remains an Englishman." In Mr. Marshall's challenge, the writer seems to discern a little yielding on the part of the cartoonist to the blandishments of the people of other nations; or it may be that, as the years pass on, he is becoming somewhat more jealous of the reputations of those among whom he lives and moves. But away with raillery, and to serious business. Now first let the writer and his challenger come to an understanding on the point as to the actual meaning intended in the use of the word "practice" in the article referred to, and that may ease the explanation, and bring them nearer an agreement in views—entire harmony is quite impossible. In employing the word, there was no intention of reflecting upon the skill of our friends across the water in the matter of producing good carbonization results by inclined retorts. There were two directions in which the writer, when penning the words in question, saw England in advance of the Continent. First, in the extent of the practice, or application, of this particular mode of carbonization; and, secondly, in being ahead of Continental practice in construction in regard to the now common adoption of the greater length of retort, which has, English engineers contend, the twofold advantages of being less costly, per unit of production, both from the constructional and manufacturing points of view. Dealing first with the extent of the practice of this mode of carbonization. We have not, so far as we remember, up-to-date figures as to the application of the system on the Continent. But about three years ago, the German Association of Gas and Water Engineers made an inquiry into the matter; and, if we may take their figures as correct, there were then *in use* and *in course of construction* a few above 4000 inclined retorts. This number included the contemplated erections at Vienna, Zurich, Malmö, Frankfort, Berlin, Milan, and Cassel, and what others we do not know. Now if there has been any notable increase elsewhere, it has escaped notice or memory. But still it is not assumed that inclined-retort erection has stood still abroad; but it will be observed that the figure took prospective work well into account. However, when he looks at the map the writer finds that England is comparatively small to the Continent or to the several countries included in those figures. But to-day in little England we can, without any effort, fix upon towns (taking Edinburgh into account) which put to our credit between 5000 and 6000 inclines; and perhaps an inquiry will divulge even a greater number. Now if our inclines were extended to lineal feet or cubical capacity, and set against the whole Continent, we think we should show that, comparatively speaking, England is in the van in the practice of the inclined mode of carbonization. Now for the second direction. The writer feels that there is little use in trying to convert Mr. Marshall to the belief that, in regard to the adoption of the longer retort, this country has left Continental practice in the rear. Our friend holds, or he did hold, very strong views on this question of the length of inclined retorts. In his own installation, if the same as formerly, the retorts are only 11 ft. 6 in.; and three years ago, he stated that, though he might be tempted to increase, under certain conditions, the length to 15 ft., "no arguments" would induce him to exceed that length. Now this is a statement more definite than the one upon which he challenges the writer. There Mr. Marshall grimly sits on that 15-feet length of fire-clay, and defies anyone to shake him off. Therefore little good can come from arguing the matter out with him. However, at home the 20-feet retort has long since become the standard for all new work, where local conditions will permit; and in renewal work, where again circumstances are favourable, it is replacing the shorter lengths, such as are prevalent on the Continent. There is—as Mr. Marshall knows well enough—an almost general agreement in this country that the greater length is the more economical from whatever standpoint the question is regarded. In connection with first costs, English engineers argue that the one producer, the one set of mouthpieces, pipes, hydraulic mains, &c., required for the shorter length of retorts are the same as are needed for the longer lengths; so that an increased retort area is obtained at a lower cost per foot. Then the operations connected with the subsequent working are not more expensive on the longer than the shorter retorts. Again, there is concord of agreement among inclined practitioners in this country that there is no depreciation in the product of the longer retort as compared with the shorter. Upon the experience on these points of our inclined engineers in this country we take our stand, from which it will be as difficult for Mr. Marshall to remove us as we believe it will be for anybody to try to displace our Copenhagen friend from his less elevated position. In this regard, then, we consider that the practice of the Continent is in the rear of our own. Even the Continental engineers are becoming converted to the belief, although slowly, that we are in advance of them in this point of inclined practice; for Mr. C. E. Brackenbury told the Institution of Gas Engineers last year that he then knew of future extensions in two European countries that would be on the 20-feet basis. An English contractor also informs us that two German engineers have told him that they also intend in future to adopt 20-feet lengths. Cannot we claim it as evidence of our practice being in advance, when we find that other countries are beginning to move forward to its adoption?—THE WRITER OF THE ARTICLE.]

Welsbach Lighting.

SIR,—Without being desirous of precipitating myself into the midst of the great Armageddon now waging between the factions of the Welsbach Company, I may perhaps be permitted to refer to the meeting recently held in London, and to comment on those portions of the Chairman's (Sir Henry Burdett's) speech touching the cost of mantles. I will pass by that portion setting forth the contamination which his immaculate Company might suffer by association with anything half so wicked as a gas company! This was too funny.

Returning to the subject of the cost of mantles. Mr. George Livesey was not far wrong when he expressed the hope that facilities would be afforded to gas companies for purchasing mantles at 3d. each. Of course, Sir Henry was filled with "holy horror and pious grief" at the bare mention of such a suggestion. Now the initial cost of a Welsbach mantle approximates closely to *one penny;* so that an advance of twopence per mantle on the enormous number of mantles the Welsbach Company, under capable commercial management, might sell, would yield a nice little profit.

To support what I say, I may state that for some time past we have been purchasing Welsbach mantles (including supports) for 6d. each, less discount; but for a still longer period we have purchased equally good, if not better, mantles by other makers at from 3d. to 4d. each, and are daily offered sample mantles by German firms at a price as low as 2½d.

The manufacture of mantles on the Continent is occupying the attention of what we term the "small industries;" and even in Denmark there are now no less than four mantle factories started by small companies, each turning out excellent mantles at the price of from 3d. to 4d each.

What, however, I wish to draw the attention of my *confrères* in England to is the fact that they should consider, as we are considering, the question of making the mantles themselves. Perhaps they would not go as far as weaving the cotton fabric (but I really do not see why they should not, considering how simple the whole operation is), but would confine themselves to merely impregnating the mantles. The capital required for a mantle-making installation on a moderate scale is not great; and the fluid is becoming daily cheaper and more easily obtainable.

The advantage of controlling the quality of the mantle one uses is undeniable; but what is even more desirable is the fact of rendering

ourselves independent of over-capitalized, badly managed, Stock Exchange promoting companies, which have hitherto done incalculable damage in retarding the development of one of the most beautiful and useful discoveries of modern times.

Copenhagen, Jan. 23, 1902. F. D. MARSHALL.

Mr. Duff's Compensation Case.

SIR,—As one who has suffered injustice by the action of an obstinate and inefficient directorate (now happily defunct), and the moral obliquity of the purchasing authority, I earnestly advise all managers and officers entitled to compensation to appear before Parliament by Counsel, and not rest content with illusory protective clauses such as the legal mind delight in, but insist on the insertion in the Bill of the "Yeovil clause," which is the only one I know that meets the case. The Gas Institute would perform a good work by retaining Counsel versed in parliamentary tactics to advise its members in such and other cases of legal doubt and difficulty.

Leyton, Jan. 27, 1902. C. E. JONES.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1902).

The second Parliament of King Edward the Seventh was opened by His Majesty in person, in full state, on the 16th inst. The Speech from the Throne contained, as usual, a reference to the several legislative proposals which, if time permits, will be introduced by the Government during the session; among them being Bills for amending the administration of the water supply in the area at present controlled by the London Water Companies, for improving the law of valuation, and for amending the patent laws. Subsequently, the President of the Local Government Board (Mr. Long) gave notice that he would introduce a Water Board Bill on an early day.

With regard to Private Bills for the session, the Chairman of Committees of the House of Lords (the Earl of Morley) and the Chairman of Ways and Means in the House of Commons (the Right Hon. J. W. Lowther) have had their customary conference to determine in which House the respective Bills should be first considered; and they have decided that the following should originate in the Upper House:—

Abertillery Urban District Council Bill, Birmingham Corporation Water Bill, Bradford Corporation Bill, Bradford-on-Avon Gas Bill, Bristol Water Bill, Buxton Urban District Council Bill, Caterham and District Gas Bill, Consett Water Bill, Darley Dale Water Bill, Deal and Walmer Gas Bill, Devonport Corporation (Water) Bill, Devonport Water Bill, Leicester Corporation Bill, Longwood Gas Bill, Margate Corporation Water Bill, Menai Bridge Urban District Council Bill, Newcastle and Gateshead Water Bill, Nottingham Corporation Bill, Rhondda Urban District Council Bill, Rickmansworth Gas Bill, Street Urban District Council Water Bill, Swansea Corporation Water Bill, Swindon United Gas Bill, Weardale and Shildon District Water Bill, West Hampshire Water Bill, Whitstable Improvement Bill, Wrexham Water Bill, and Ystradfellte Water Bill.

The following Bills will therefore originate in the Lower House:—

Abercarn Urban District Gas Bill, Barking Gas Bill, Bedford Corporation Water Bill, Belfast Corporation Bill, Birkenhead Corporation Bill, Bournemouth Gas and Water Bill, Broadstairs Gas Bill, Bromley Gas Bill, Chard Gas Bill, Chigwell, Loughton, and Woodford Gas Bill, City of London (Streets) Bill, Commercial Gas Bill, East Worcestershire Water Bill, Fareham Gas Bill, Finedon Urban District Water Bill, Grand Junction Water Bill, Halifax Corporation Bill, Higham Ferrers and Rushden Water Board Bill, Huddersfield Corporation Bill, Kent Water Bill, Knaresborough Improvement Bill, Leamington Corporation Bill, Leyland and Farington Gas Bill, Limpsfield and Oxted Water Bill, Liverpool Corporation Bill, London Water (Purchase) Bill, Newport Corporation Bill, North Warwickshire Water Bill, Omagh Urban District Gas Bill, Reading Gas Bill, Shepton Mallet Gas Bill, South Metropolitan Gas Bill, Ticehurst Water Bill, Tipton Urban District Council Bill, Wadhurst Gas Bill, West Ham Gas Bill, and Wolverhampton Corporation Water Bill.

The Standing Orders have been complied with in respect of the petitions for all the above-named Bills.

As usual during the early days of the session, a number of private members' Bills have recently been introduced. They deal with the following subjects: The rating of machinery, employment in coal mines, the establishment of wages boards, the amendment of the Borough Funds Acts, the limitation and definition of the rights of persons taking water from underground sources for purposes of public supply, and the granting of certificates to persons having charge of steam-engines and boilers. One of the measures above referred to is the Mines (Eight Hours) Bill, which has been introduced by Mr. Jacoby, the member for Mid-Derbyshire, and stands for second reading on the 5th of March. It is interesting to note that this is the fourth Parliament to which the Bill has been submitted. Its history has been recorded in "The Times" as follows: "In 1892, when it was introduced by Mr. Leake, the second reading was negatived, on the motion of Mr. Burt, by a majority of 112. In 1893, the Bill was read a second time, on the motion of Mr. S. Woods, by 279 to 201—the opposition being led by Mr. D. A. Thomas. In 1894, when the Bill fell to the charge of Mr. Roby, and the motion for rejection was submitted by Sir A. Hickman, the second reading was agreed to by a majority of 87; but in Committee an amendment proposed by Mr. Thomas, providing that the eight hours limit should be enforced only in those counties in which the Act was adopted by a majority of the workmen employed underground, was carried by 115 to 107; whereupon Mr. Roby intimated that the Bill would be withdrawn. In 1897, the measure was defeated, on the motion of Mr. Thomas, by a majority of 41. In 1900, when Sir James Joicey moved the rejection and Mr. Thomas voted for instead of against the Bill, it was thrown out by 199 to 175. Last year, although the second reading was carried by 212 to 199, the exigencies of the session prevented it getting beyond the Committee stage."

On Monday last week, a return was ordered, on the motion of Mr. D. A. Thomas, "giving for the year 1901 the export of coal from each port in the United Kingdom to each country abroad, together with summary statements showing the export of coal in every period of three months from the principal districts of the United Kingdom to the principal groups of foreign countries; and also showing the quantity of coal shipped at each port in the United Kingdom for ships' use on foreign voyages during the like periods," in continuation of the Paper No. 119 of last Session.

LEGAL INTELLIGENCE.

The Welsbach Litigation.

On Saturday, thirty-six actions by the Welsbach Incandescent Gas-Light Company, Limited, against infringers of their 1893 patent came before Mr. Justice Phillimore in the King's Bench Division of the High Court of Justice; the facts being the same in each case. Mr. Walter said the plaintiffs were the owners of letters patent granted in 1893, which had been infringed by the defendants; and the actions came on in default of defence. He asked for an injunction restraining further infringement, for an inquiry as to damages, for the delivery up of the offending mantles, and for the costs of the action. His Lordship made the orders as asked, and granted certificates that the particulars of breaches were reasonable and proper.

Welsbach Infringer Interdicted in Scotland.

In the Outer House of the Court of Session, before Lord Kyllachy, evidence was to have been led last Wednesday in an application by the Welsbach Incandescent Gas-Light Company, Limited, to have David M'Mann, carrying on business at 241, George Street, Aberdeen, as the Incandescent Fittings Company, and his wife, interdicted from selling infringing mantles. Interim interdict was granted some time ago, and at present there is a warrant in existence for the apprehension of M'Mann for breach of that order, which has been proved against him. Mr. W. J. Robertson said there was no appearance for the respondents. M'Mann had fled the country; and the agent for the respondents had received a letter from Mrs. M'Mann stating that she did not intend to continue the litigation. In these circumstances, he moved that the interim interdict should be made perpetual, and that the respondents should be found jointly and severally liable in expenses. He asked for expenses because the complainers held a certificate that the question of the patent had been the subject of trial. Lord Kyllachy gave decree as asked.

Another Welsbach Interdict.

On Saturday last, in the Bill Chamber of the Court of Session, Lord Pearson heard Counsel in an application by the Welsbach Company to have A. B. Robertson, a plumber, of No. 3, Westfield Road, Aberdeen, interdicted from infringing the Company's patent of 1893, by the sale of mantles. In reply, Robertson stated that the patent was invalid by reason of prior use; that the certificate which the complainer obtained from Justices Channell and Day in the King's Bench Division on April 24 last was granted in his absence; and that he did not manufacture mantles, but sold them as the agent of the General Incandescent Company, Limited, of No. 92A, Aldersgate Street, London, against whom an action was at present pending in England, at the instance of the complainers, and in which interim injunction was refused on Aug. 27 last. He denied infringement, and offered to keep an account of his sales. Lord Pearson passed the note for trial of the case, without requiring the complainers to find caution, and granted interim interdict. He said he could not order the respondent to keep an account of his sales, because the mantles of the complainers were quite distinguishable from those which were said to be infringements of the complainers, and the respondent could easily separate the one from the other. If he chose not to sell any of those which did not belong to the complainers, the interim interdict would do him no harm.

Innerleithen Gas Company's Constitution.

In the First Division of the Court of Session last Friday, intimation was ordered of a petition by the Innerleithen Gas Company, Limited, asking the Court to sanction the substitution of a constitution making the Company a body under Memorandum and Articles of Association, instead of under a contract of co-partnery. The Company was established in April, 1846, and was incorporated under the Companies' Acts in September, 1898. The original capital was £800, in 400 shares of £2 each; but before 1898 it had been increased to £3333, in 1111 shares of £3 each, all of which had been issued and fully paid up. The form of the Company's constitution has been found to be not convenient but cumbersome; and the shareholders have, by special resolution, duly passed, approved of a Memorandum and Articles of Association, which it is proposed to enact as the constitution of the Company. It is submitted that the alteration is expedient: (1) Because, having regard to the terms of section 196 of the Companies Act of 1862, doubts may be raised as to which clauses of the contract of co-partnery must be regarded as conditions, and which as regulations of the Company within the meaning of that section; (2) because it is desirable, in accordance with modern practice, to express the objects of the Company in greater detail, so as to avoid and preclude, as far as possible, any doubts as to the Company's powers within the ordinary scope of its business; (3) because a constitution by Memorandum and Articles of Association is now so well understood, both at home and abroad, that the possession of such a constitution facilitates business, and precludes questions as to how far a company constituted by contract of co-partnery, though registered, stands in a like position; and (4) because, in order to meet the existing demands and prospective development of business, and the growing competition, it is necessary to secure some extensions of the objects of the Company. There are no debentures or debts other than ordinary trade debts; and no one will be prejudiced by the proposed alteration.

Supply of Electricity to a Receiver in Possession.

In the Chancery Division of the High Court of Justice a few days since, Mr. Justice Kekewich had under consideration an application to restrain by injunction the London Electric Supply Corporation from taking any proceedings, by cutting off or discontinuing the supply of current from their mains to the premises known as St. Ermin's Hotel, Victoria Street, to recover the amount due to them by the Mansions Proprietary, Limited, in respect of current supplied prior to the 17th inst. The interest of the case, so far as our readers are concerned, lies in the similarity of the circumstances to those of the action recently decided by Judge Edge at the Clerkenwell County Court, as reported in the "JOURNAL" a fortnight ago. They were as follows: The plaintiff, Mr. Husey, was in occupation of the premises under an order of the Court directing the Mansions Proprietary, Limited, to give him possession as Receiver; and it was contended on his behalf that, under the Electric Lighting Acts, he was entitled to be supplied with electricity, and that the defendants were not justified in declining to supply him because a previous occupier of the hotel had not paid for the electricity supplied by the Company. For the defendants, it was submitted that they had a right to do what was complained of. It was further urged that the plaintiff had not brought himself within the conditions of the Corporation's Provisional Order of 1889, entitling him to a supply of electric energy. It was also stated that he had not given the usual notice requiring a supply of such energy. Mr. Warrington, K.C., and Mr. Mitchell appeared for the plaintiff; Mr. B. Ogden Lawrence, K.C., and Mr. Cartmel for the defendants. His Lordship asked when the defendants had first given notice to the plaintiff that they would discontinue the supply of energy unless he complied with the conditions of the Order. Mr. Lawrence replied that they had not given such notice, and were not called upon to do so. In this case the plaintiff was little more than caretaker for the debenture-holders. His Lordship said the plaintiff was clearly in the hotel as occupier; and it seemed to him that he was entitled, under the Order, to have a supply of current. The defendants had taken a wrong view of the case. Mr. Husey must serve proper notice for a supply, and enter into a contract for that purpose, so as to bring him within the conditions of the Order. Until this had been done, the supply of current must be continued.

Interesting Point under the Workmen's Compensation Act.

At the Leeds County Court last Friday, his Honour Judge Greenhow decided an interesting point in connection with the law of compensation to workmen. The applicant was Mark Waldron, machine man at the New Wortley Gas-Works of the Leeds Corporation; and the respondents were the Corporation. Mr. Masser appeared for the former; Mr. J. O. Andrews represented the latter. On the 7th of November, while on duty at the above-named works, Waldron had his leg broken through the fall of a machine. He was taken to the Leeds Infirmary, where he remained till six weeks ago. About three weeks after the accident, his brother, on his behalf, called at the works and asked to be paid the amount due as compensation for the injury. He was told that, while the officials did not dispute his relationship to the applicant, he must produce an authority signed by the latter. Mr. Masser was then consulted, and, in reply to a letter from him, the Corporation admitted liability. Thereupon an agreement was drawn up; but the representatives of the Corporation refused to sign it, on the ground that they objected to the clause which provided for their paying the costs in connection with the agreement. With this clause struck out, an agreement was signed. Mr. Masser now applied to the Court to have the memorandum of agreement put on record as an acknowledgment of the respondents' liability. Mr. Andrews contended that, in accordance with the recent judgment in the case of *Field v. Longden*, no agreement was required, so long as there had been an admission of liability and payment of compensation. His Honour agreed with this view, and dismissed the application.

Prepayment Meter Theft.

At the Leeds City Police Court on Monday of last week, four lads were charged with having stolen a number of coppers from a penny-in-the-slot gas-meter fixed in an empty house in Mabgate. When a detective-constable visited the place, he found that the meter had been torn from its position, forced open, and emptied of its contents. The gas was escaping; and had a match been inadvertently struck, possibly the place would have been wrecked, and injury to life and limb resulted. The officer was compelled to detach the meter entirely, and hammer up the pipe. Each of the accused was ordered to receive four strokes with the birch rod.

Gas Coal for Stettin.—A dispatch has been received, stating that tenders are invited by the Stettin Gas-Works, for the supply of 30,000 tons of English gas coal. Contract forms may be seen at the "Gasbüreau, Gr. Wollweberstrasse, 54 II.," or can be had there on payment of 50pf. (6d.).

Gas Supply at Rowley.—At the monthly meeting of the Rowley District Council, complaints were made of the bad quality of the gas supplied by the Cradley Heath Gas Company and the Rowley Regis and Blackheath Gas Company. Mr. Litch asked if the Council had no means of testing the gas; and the Clerk replied that there was no public testing-station, but the members could visit the works and see the gas tested. It was decided to write to the Companies asking them to remedy the matter.

Rainfall in the Elan Valley.—It is reported that the rainfall in the Elan Valley during last year was 56·35 inches on the average of eight gauges on the watershed. Compared with the previous year (when the fall was 63·04 inches), there is a decrease of more than 6½ inches. The gauges were first established on the watershed in 1893; and the lowest record since that time was in 1895, when the fall was 53·47 inches. The next lowest was last year's fall. As showing the value of the Welsh district as a watershed, it may be stated that, whereas the rainfall in the Elan Valley last year was 56·35 inches, it was only 24·38 inches at Whitacre, and 22·58 inches at Witton.

MISCELLANEOUS NEWS.

JUBILEE OF MR. S. W. DURKIN.

Last Tuesday, Mr. S. W. Durkin, the Manager of the Southampton Gas Company, and the President of the Incorporated Gas Institute for the year, was the recipient of a handsome presentation on the occasion of the celebration of his fiftieth year in the service of the Company. The men's mess-room at the works was the scene of the interesting proceedings, and flags and bunting helped to make the spacious room present quite a festive appearance. Dr. T. W. Trend, J.P. (the Chairman of the Company), presided over a crowded gathering; and among those who were with him on the platform were Mr. Durkin, Mr. C. Crowther Smith (the Secretary), and Mr. F. Durkin.

The CHAIRMAN, after expressing the pleasure it gave him to be present, said the celebration of a Jubilee was an event to be remembered. He had had the privilege of knowing Mr. Durkin for about forty years, and had watched with interest his progress in the gas world. Now-a-days a gas manager, to be successful, needed to be a skilful engineer, a practical chemist, and a trained accountant, and all these attributes Mr. Durkin possessed in an eminent degree—so much so, in fact, that he had earned the full appreciation of the Directors, proprietors, and consumers. Another qualification which Mr. Durkin possessed was that he had a tender heart, and the man who did his work honestly always had his sympathy.

Mr. J. J. LEACH then related the circumstances which led up to the event of that afternoon. He said that when it was known Mr. Durkin was about to enter upon the fiftieth year of his connection with the Company, the staff felt they could not allow such an occasion to pass without some demonstration on their part. The employees and some of the leading consumers outside were consulted, with the result that a sum of £130 had been collected. It was proposed to hand over to Mr. Durkin a cheque for 100 guineas, with an illuminated address, together with a diamond and turquoise ring for Mrs. Durkin; and he had the greatest pleasure in asking the Chairman to make the presentation.

The CHAIRMAN at once complied with the request. Addressing Mr. Durkin, he said he could not express the pleasure he felt at having the opportunity of handing him so handsome a present. Mr. Durkin would know full well what it meant to receive such a gift from those under his care; and he (the Chairman) hoped Mr. Durkin would be spared for many years to look back with pleasure on the afternoon's proceedings, and with pride at the beautifully illuminated album which contained the best wishes of those whom he met in every-day life.

Mr. LEACH then read the address, which had been very artistically illuminated by himself—a South Kensington medallist and prize student. The text was as follows:—

Gas-Works, Southampton.

Presented, together with a chèque for one hundred guineas, to S. Westall Durkin, Esq., in commemoration of his Jubilee of service in connection with the Southampton Gas Light and Coke Company (during thirty-four years of which time he has held the position of Manager), by the members of the staff, the inspectors, foremen, and workmen engaged at the gas-works, and others, to the number of nearly four hundred, whose names are herein recorded. The subscribers unanimously offer their hearty congratulations to Mr. Durkin on his completion of so long a period of honourable service. They further congratulate him upon his election for the current year to the important office of President of the Incorporated Gas Institute, and they unitedly join in wishing him a large measure of health, happiness, and prosperity for many years to come.

January 7th, 1902.

Mr. DURKIN rose to acknowledge the present, and was greeted with a storm of cheers. In feeling terms he thanked the subscribers for their handsome appreciation of his fifty years' connection with the Company. In the course of some interesting reminiscences, he stated that in 1852, when he first became connected with the works, the annual output was 34,200,000 cubic feet of gas; in 1901 it was 547,509,000 cubic feet—an increase in 49 years of 1510 per cent. The daily make of gas in 1853 was 209,000 cubic feet; in 1867 it was 526,000 cubic feet; and in 1901, 2,512,000 cubic feet. He thanked all those who had subscribed to the testimonial, and said that, handsome as it was, he should value quite as much the kind references made to him that day, and the presence of those who had met together to do him honour.

Mr. C. CROWTHER SMITH and others added their testimony to the excellent qualities of Mr. Durkin; a vote of thanks was accorded the Chairman, and Mr. Leach was thanked for his services as organizer of the presentation.

COMMERCIAL GAS COMPANY.

The Application to Parliament.

A Special General Meeting of the Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair—for the purpose of submitting to the proprietors the Bill being promoted in Parliament.

The SECRETARY (Mr. H. D. Ellis) having read the notice convening the meeting,

The CHAIRMAN said that, as the proprietors heard from the notice, the sole business of the meeting was to approve the Bill which had been deposited in Parliament. If it was the wish of the proprietors that the Bill should be read in full, it could be done. But it was rather long; and he could give a short epitome which would put them in possession of the whole of the points of the Bill, if this would be sufficient for the proprietors' purpose. The proprietors assented, and the Chairman proceeding said the preamble of the Bill gave, as usual, a short parliamentary history of the Company, the capital that had been issued, and recited that it was expedient that the objects of the Bill should be attained. Coming to the sections, Nos. 1, 2, and 3 were formal, and provided for the short title of the Bill when it became an Act, for the incorporation of sundry General Acts, and the interpretation of words and expressions. Section 4 provided for the recovery,

in the County Court, of sums not exceeding £50. Sections 5 to 9 provided for the conversion of the capital stocks of the Company—the 10 per cent. into 4 per cent. stock; the 7 per cent. into 3½ per cent. stock; and the 4½ per cent. debenture stock into 3 per cent. debenture stock. Sections 10 and 11 provided for the extinguishing of fractions of stock below £5. Section 12 was very important. It enacted that, after Jan. 1, 1903, the Company should supply 15-candle gas, and after the 1st of July, 1907, 14-candle gas—with power to accelerate the last-named reduction of illuminating power by giving six months' notice. It also provided for the reduction of the standard price from 3s. 9d. to 3s. 6d. per 1000 cubic feet in the case of 16-candle gas; to 3s. 5d. in the case of 15-candle gas; and to 3s. 4d. in the case of 14-candle gas—with an increase or decrease of dividends equivalent to 6s. 8d. per cent. on the unconverted stock for every penny the price of gas was reduced below, or raised above, the standard price. Section 13 described the burner for testing the illuminating power; and section 14 provided that the Company should supply, free of charge to the consumers, burners suitable for use with gas of the lower illuminating power gas. Then sections 15 to 23 provided for the raising of £500,000 additional capital (of which £375,000 should be new 4 per cent. stock, and £125,000 3 per cent. debenture stock), and also stated the method of issuing such stocks. Section 24 related to employment agreements with employees under the profit-sharing scheme. Sections 26 to 28 gave power to purchase additional lands not to be used for gas making, imposed a restriction against taking houses of the working classes without providing houses in substitution, and power to sell or lease lands not used for the purposes of the undertaking. Section 29 related to the closing of the transfer books, and the voting power of shareholders. It did not change the voting power; but it made the necessary correction on account of the conversion of the stocks. Section 30 dealt with the altered qualifications of the Directors and Auditors, also rendered necessary by the conversion of the stocks; and section 31 dealt with the payment of the costs of obtaining the Act, which had, of course, to be met by the Company. There was a schedule attached to the Bill, which contained regulations regarding the payment of deposits and savings to the representatives of deceased employees. The proprietors would have noticed that there were four main provisions in the Bill; and these were the only ones he need direct attention to. The first was the conversion of the stocks. In this, they were following the precedent that had been set by the other two Metropolitan Gas Companies, and were bringing the Commercial Company more into line with them. The object was to make the nominal amount of the stock more nearly equal to the market value, and the dividend more nearly equal to the return which a purchaser would get for his money. It would be understood that in future, as now, all stocks would be sold by auction to the highest bidder. At the present time, the sale of stocks by auction in the case of this Company was voluntary—the proprietors having agreed to so dispose of them; but in the future, if the Bill became law, the sale by auction would be compulsory. Then, as to the standard price, the existing standard was 3s. 9d.; and the proprietors were entitled to 5s., or ¼ per cent., more dividend for every penny the price of gas was reduced below 3s. 9d. Sir James Rankin's Committee—which was appointed to inquire into the powers of charge of the Metropolitan Gas Companies in 1899—recommended that there should be a lower standard price for gas, that the old 5s. per cent. increase or decrease of dividend for every penny below or above the standard price should be continued, and that an additional 5s. per cent. should be given for every complete 3d. by which the price of gas was reduced below the standard figure. The following year, when the South Metropolitan Gas Company went to Parliament, Mr. Oldroyd's Committee, who sat upon their Bill, agreed to the extra 5s. for every complete 3d. reduction being divided into three parts, and one-third thereof (or 1s. 4d.) being given in addition to the other 5s. for every penny reduction. The Directors had followed this precedent in their Bill. The result was this, that when the price of gas was 2s. 9d., the proprietors would receive the same rate of dividend as now. If the price of gas was above 2s. 9d., they would receive rather less; but if it fell below 2s. 9d., they would receive rather more than at present. In this way, they were securing the object of Sir James Rankin's Committee, which was to give a strong incentive to the Gas Companies to keep down the price of gas. Since 1883—except last year, which was the sole exception—the price had been below 2s. 10d. per 1000 cubic feet. Then as to the reduction of the illuminating power, they were following the precedent of the South Metropolitan Gas Company; and, as he explained when he had the pleasure of meeting the proprietors in October last, owing to the introduction of the Welsbach burner, it was no longer of any use to the consumer to have a high-power gas. He was just as well off with a gas of low illuminating power, which, when he consumed in an incandescent burner, gave much more light with a smaller consumption of gas. However, in the Bill, the Directors had taken the power, or rather they had made it obligatory, that the Company should supply first 15-candle gas, and subsequently 14-candle gas. The only other point to call attention to was as to the additional capital. They had asked for £500,000, which would, it was thought, be sufficient to last for five years. The Bill dealt with the mode of issuing this capital. The proposal—following the usual precedent—was that they should have power to offer it first to the consumers and employees of the Company at not more than 5 per cent. below the market value. If it was not taken up by them, then the Directors must offer it to the public, at the same reserve price. If they did not take it, then the Directors could offer it to the proprietors at the same reserve price. If the proprietors did not take it, then they would have to offer the stock to the public again at a lower reserve; and if they did not take it up at that price, then the Directors might offer it to the proprietors at the reduced reserve. This sounded rather cumbersome; but the Board thought it better to follow precedent, and incorporate it in the Bill. He then moved—"That the Bill introduced into Parliament, and now read, intituled, 'A Bill to convert the Capital Stocks and Debenture Stock of the Commercial Gas Company into stocks of other nominal amounts, but yielding equivalent amounts of Dividend or Interest, and to empower the Company to raise Additional Capital, to amend the Acts relating to the Company, and for other purposes,' be and the same is hereby approved, subject to such additions, alterations, and variations as Parliament may think fit to make therein."

Mr. WALTER HUNTER seconded the motion.

Mr. E. W. COLLYER asked, with regard to the reserve price for the stocks, if the Directors had arranged so that it could be fixed below the nominal amount. He made this inquiry because the Gaslight and Coke Company had made a tremendous mess over it; and they could not get the price.

The CHAIRMAN: You mean to say they could not issue stock below par. Our Bill provides for that.

Mr. GEORGE ENNIS said the very beneficial lines on which the Bill was framed would make it of value to the proprietors, if they could get it passed. The Chairman had taken the proprietors through the main provisions; but there was one which affected the proprietors very vitally, and which the Chairman had entirely passed over. It introduced a new principle; and a thing which, in his opinion, was without precedent. If there was a precedent, he should be glad if the Chairman would inform him of it. Before proceeding with his principal point, he complained that the shareholders were not allowed copies of the Bill; and he thought the demand of a shilling for a copy was unwarranted. He did not know how the proprietors were to express an opinion regarding the provisions of the Bill, and to vote upon it, unless they were provided with the material upon which to found an opinion. The demand of 1s. for a copy was inconsistent with clause 31, which said that "all the costs, charges, and expenses of, incident, and preliminary to, the preparing and applying for, obtaining, and passing of this Act, and otherwise in relation thereto, shall be paid by the Company." As it was, he was in the somewhat awkward position of trying to explain to the proprietors one of the obnoxious features of the Bill, without their having had an opportunity of seeing the clause for themselves and considering it. He pointed out to the Chairman at the last half yearly meeting that he could see no reason why the stock should not have been reduced to one denomination—say, to a 3½ or 4 per cent. stock, instead of burdening the Company with two classes of stock. Mr. Livesey, who was a leader in these matters—and he thought he could trace his hand very clearly in the Bill—had given him a private assurance that this could not be done.

Mr. LIVESEY: I think I told you we could not avoid making the two classes—Parliament would not allow the two classes to be united.

Mr. ENNIS said he took Mr. Livesey's assurance, because his assurance was a great thing to him and to all the shareholders. But he (Mr. Ennis) failed to see any actuarial reason for it.

Mr. LIVESEY: I tried it in one case; and the Lord Chairman of Committees absolutely refused to allow it.

Mr. ENNIS said he was obliged to Mr. Livesey for the explanation. But he had not heard it before; and he would say no more on the subject. Now he wished to refer to section 7, which the Chairman had not touched upon. The first part provided for the inscription of the new stocks upon the stock registers. Then, about half-way through the section, it said: "Provided always that the Company shall not be required to deliver any new certificate unless and until the existing certificate or certificates in substitution for which such new certificate is to be delivered shall either have been given up to the Company to be cancelled, or have been proved to the reasonable satisfaction of the Company to be lost or destroyed, and an indemnity have been given to the Company against every and any claim in respect thereof." There was nothing in this that was not reasonable; but it was preliminary to what followed, and which he proposed should be left out. It was this: "And the Company shall not be compellable to pay any dividend on any capital stock, or any interest on any debenture stock, payable in respect of any half year after that ending the 31st day of December, 1902, unless and until an exchange of certificates relative to such stock in accordance with this Act has been applied for, and the exchange has been duly effected." These words he maintained were entirely without precedent.

The CHAIRMAN: They are absolutely in the common form.

Mr. ENNIS said if they had a precedent, it was unwarranted. He went on to contend that the clause was merely for official convenience, and might seriously embarrass some of the proprietors. In his opinion, the proprietors ought not to be subjected to a penal clause of this nature. He moved that the clause be eliminated from the Bill.

The CHAIRMAN stated that he had precedents for the clause. It was, in fact, in every Act he had seen. Its object was to enable the conversion to be carried through, and this could only be done by getting the old certificates sent in. The Directors would not use the clause harshly.

Mr. JOHN HOLLAMS (Solicitor) pointed out that there could be no amendment. The motion must be either carried or rejected; and if there was any difference of opinion, there must be a poll.

The motion on being put to the vote had only two dissentients.

Mr. ENNIS demanded a poll.

The CHAIRMAN appealed to Mr. Ennis not to insist.

Mr. ENNIS said if the Chairman would pledge himself to have the clause struck out when the Bill was in Committee, he would withdraw his objection.

The CHAIRMAN: You quite understand this clause is permissive and not compulsory?

Mr. H. LESINGHAM: But the compulsory part rests with the office.

The motion was again put. Mr. Ennis voted against it; and it became necessary to take a poll.

Messrs. Dickens and Savage were appointed Scrutineers; and nearly an hour was required for the performance of their duties.

At the time fixed for the result to be declared, the CHAIRMAN announced that there were 1330 votes for the resolution, and 17 against—a majority of 1313. Mr. Ennis did not vote.

Mr. MURCH moved a vote of thanks to the Chairman and Directors. He said he thought the poll had shown the feeling of the proprietors, and that Mr. Ennis carried very small weight indeed.

Mr. GENT, in seconding the motion, said he thought it was a great shame they should have been bothered in this way.

The motion was unanimously carried.

The CHAIRMAN, in acknowledging the compliment, remarked that the Board were gratified to find that so large a majority of the proprietors agreed with them.

BURNERS FOR REDUCED ILLUMINATING POWER.

At the Meeting of the London County Council last Tuesday—Mr. A. M. TORRANCE in the chair—the report presented by the Public Control Committee contained, in its opening paragraph, the remarks on the subject of the supply, by the South Metropolitan Gas Company, of burners suitable for the consumption of the lower illuminating gas they are now sending out, to which reference was made in the "JOURNAL" last week.

Mr. W. C. JOHNSON (the Chairman of the Committee) having moved the reception of the report,

Mr. A. L. LEON proposed, as an amendment, that the motion should not apply to the first paragraph. He recounted the circumstances under which the Company had obtained authority to supply 14-candle gas, and complained that, in the report, the Committee had not stated that any steps had been taken by the Council, on behalf of the consumers in the South London district, to inform the public what was a "suitable burner," in the words of the Act, for such gas. He presumed the object of Parliament was that the consumers should not be put to the expense of providing new burners to help the Company to save £100,000 a year by supplying 14 instead of 16 candle gas. The Company had denied their obligation to supply governor burners, except on payment of 6d. each. It was stated in the report that what was known as the "stuffed" burner was one by which a great deal more gas would be consumed under an increased pressure. He had obtained from the Chemist of the Council (Dr. Frank Clowes) a table of the different amounts each consumer had to pay according to the pressure of gas. The normal pressure in the evening was something over 2 inches, and with the governor burner to which the Committee had referred, the quantity of gas burnt was only 5 cubic feet per hour; but directly they came to what was called the "stuffed" burner, which was the only one the Company proposed to put free of charge in the consumers' houses, the consumption rose to a little over 6½ cubic feet per hour. If, as was sometimes the case, they had a pressure of 3 inches, the quantity of gas consumed rose by something like 50 per cent. With the "stuffed" burner, 9 cubic feet of gas per hour would be consumed; whereas with the governor burner only 5·3 cubic feet would be used. This, he contended, was not what Parliament intended; and he asked the Council to take upon themselves the responsibility of testing the question of what was a "suitable" burner according to the terms of the Act. The matter was important, because the Commercial Gas Company, who supplied the East-end of London, had promoted a Bill with precisely the same object as the South Metropolitan Company. He thought the Council should be prepared to fight this question with the latter Company, and should endeavour to secure the insertion in the Bill of the Commercial Company of such clauses as would assure that an adequate governor burner should be supplied free of charge. When a company introduced a Bill for the purpose of improving the prime cost of an article supplied to the public, the consumers should not suffer thereby. He pointed out that when the electric light companies wanted to increase their pressure from 100 to 200 volts, they were told by Parliament that they must pay the extra cost incurred by the consumers in altering their fittings. The present position was very much on all-fours with that; and he asked the Council to pass his amendment, in order that the Committee might report more fully than they had done as to whether it would not be wise to obtain the opinion of the Solicitor as to what a "suitable" burner really was, and, if necessary—and he hoped they would do it—recommend that some test case should be taken to the Courts, so that they might have a decision as to whether a burner "stuffed" with cotton wool could be considered a satisfactory one from a consumer's point of view.

Mr. YATES remarked that for years the Public Control Committee had been trying to keep up the standard of illuminating power of gas to 16 candles, and now Parliament had, "at one fell swoop," nullified their efforts. The South Metropolitan Gas Company, by their Act, were bound to supply consumers gratis with a burner which was "suitable" for 14-candle gas. The Act did not state what was the meaning of the word "suitable;" and the Company appeared to be acting as if it meant a burner that would consume as much gas as possible. In order to have it made perfectly clear, in a fresh Act of Parliament, that the word now meant economical as well as suitable for burning 14-candle gas, he would second the amendment.

Mr. RUSSELL SPOKES supported the amendment, and questioned the right of the Company to charge 6d. each for governor burners, which he maintained they had undertaken to supply when they were allowed to reduce the illuminating power of their gas.

Mr. N. W. HUBBARD said there was no doubt whatever that there was a very strong feeling on this matter in South London. When the Company obtained the concession to reduce the illuminating power of their gas, it was generally thought that the consumers would have burners free of cost. Several persons, basing their belief on reports drawn up by Mr. Johnson, wrote to the Company asking for governor burners; but they were informed that, if they wanted them, they would have to pay 6d. each. The other kind of burner—the "stuffed" burner—was a very much more expensive one, as a greater quantity of gas was consumed by it. He hoped Mr. Johnson and his Committee would see their way to taking some steps to protect the consumers, so that they might have governor burners free, as they expected.

Mr. JOHNSON said the Committee were fully aware of all the points raised by the speakers. He hoped to have been able to bring forward a paragraph that day to announce that the Committee had come to a satisfactory agreement with the Company; but he was not able to do so. The paragraph in the report did not contain any recommendation to the Council, and was somewhat in the nature of an interim report. The Committee were engaged in inquiring very fully into the subject; but their investigations were still incomplete. If, instead of moving that the paragraph be referred back, Mr. Leon would propose that the consideration of it should be deferred for a fortnight, he would be able to give the Council full information as to the result of the Committee's inquiries.

On a show of hands, the amendment was carried *nem. dis.*; and the report was received, with the exception of the first paragraph.

THE GAS QUESTION IN PARIS.

Discussion of the Clauses of the Chamon Scheme.

At the close of the article in the last number of the "JOURNAL" in which an account was given of the proceedings at the special assembly of the Paris Municipal Council convened by the Prefect of the Seine to discuss the gas question, it was briefly mentioned that the consideration of the clauses of the Chamon scheme—upwards of 200 in number—occupied the Council on the 15th and 17th inst. They were both very long sittings—the first lasting from three in the afternoon till just after midnight; and the second, as recorded last week, commencing at the same hour and not terminating till six o'clock the next morning. On the whole, the scheme underwent but little change, as the majority by which its principle had been adopted was sufficient to defend its details from the attacks made upon them. Some points raised in the discussion on clauses were noticed last week; but it may be of interest to give a fuller account of this part of the proceedings—which, on the whole, constitute a "record" in the history of the Council—than we were then able to furnish.

Clause 1 set forth that the existing Company are to hand over to the City, on payment of the sum of 100,000,000 frs., their share of the statutory reserve of 200,000,000 frs. and of the assets divisible at the end of the present concession (Dec. 31, 1905). To this an amendment, reducing the amount by 10,000,000 frs., was proposed by M. Landrin; but it was rejected by 40 votes to 38.

The next clause to excite opposition was No. 6. It was specified therein that, in addition to the payment of the 100,000,000 frs. mentioned in clause 1, the handing over of the works was to be conditional on the City bearing the capital expenditure incurred or to be incurred between Jan. 1, 1901, and Dec. 31, 1905, with the exception of any outlay required for the extension of mains supplying the outlying districts, or for such general maintenance of the plant and works as would not have the effect of increasing their value. M. Desplas proposed that the date on which the City would assume the responsibility for the expenditure on capital account should be Jan. 1, 1902; but his amendment was lost by the same majority as before.

The succeeding clauses, up to No. 24, may be passed over; and then we come to those dealing with the reduction in price (Nos. 25 to 32). They set forth that from Jan. 1, 1902, the price of gas to private consumers would be reduced from 30 c. to 20 c. per cubic metre; and that, by way of compensation, the City would pay the Company an annual indemnity to be calculated in the way subsequently described. The payments were to be made monthly, in amounts proportionate to the quantity of gas supplied to private consumers in Paris in each month of the year 1901. In order to arrive at the amount of the annual indemnity, there would first be ascertained for each of the two years 1899 and 1901 the cube of the gas supplied in Paris at the price of 30c. per cubic metre, and the higher of the two figures taken. The annual indemnity would be equal to 10 c. per cubic metre upon the cube thus determined, whatever might be the quantities of gas actually sent out during the years 1902 to 1905. In order that the benefit of any increase in consumption resulting from the lowering of the price of gas from Jan. 1, 1902, might be duly recognized, it was to be understood that if, for the years 1902 to 1905, considered separately, the working account showed a profit higher than that realized in the year 1901, a sum equal to two-fifths of the excess would be added to the working expenses of that year as an "allowance to the City and the farming Company;" and this sum would be paid by the Company in the proportions of 75 per cent. to the former and 25 per cent. to the latter. These clauses gave rise to some discussion. MM. Gelez and Brard proposed other rates than the 20 c. per cubic metre specified as the new tariff; but their suggestions were rejected by the usual 40 votes to 38. With regard to the annual indemnity, to be paid by way of compensation, MM. Félix Roussel, Labusquière, and Desplas protested, in long speeches, against such prodigality, as they called it, on the part of the City. They were replied to by M. Sauton; and the result was that the text of the clause remained unaltered.

With the passing of clause 32, Part I. of the scheme was disposed of; and M. Veber considered this a favourable opportunity for again bringing forward his former proposal. He moved that the Council should pause at this point, and reconsider the question of future management—limiting themselves to laying before the shareholders of the Company the first part only of the scheme. However, on this proposition being put to the vote, it was lost by 40 votes to 37; and the discussion was continued. Part II. of the scheme contained the financial and administrative clauses, and numerous were the amendments proposed; but, except where they were agreed to by the reporter (M. Spronck), they shared the same fate as their predecessors. M. Landrin, for example, in association with M. Desplas, moved that the capital of 100,000,000 frs. should be reduced by one half; but the motion was lost by 40 votes to 37. On the other hand, the Council decided (it was the solitary exception), by a majority of one, that the consumers' deposits should bear interest. Half-an-hour after midnight, clause 54 was voted upon, and it was then decided to adjourn.

The discussion was resumed at three o'clock in the afternoon on the 17th inst.; and, for length, the sitting exceeded all its predecessors. Things went pretty smoothly at the outset. Amendments were proposed, resisted, defended, and finally either accepted by the reporter or rejected. In this way the Council were pretty well occupied till eight o'clock, when there was a suspension of hostilities to allow the contending parties to acquire fresh vigour by dining. Just before ten o'clock, the Council re-assembled—apparently somewhat "enervated," according to one of the papers—after their two hours' rest. They had not been long at work before there was a squabble. Clause 83 set forth that the gas to be supplied was to be "extracted from coal," and might be enriched "with the bye-products of distillation;" and when it was reached, Dr. Navarre demanded its amendment, so that it should specify clearly that the new Company should supply "dry" gas, and that there should be no admixture with it of water gas, which was "dangerous to health owing to the large proportion of carbon monoxide it contained." The President (M. Dausset) refused to put the amendment to the vote; whereupon a tremendous hubbub ensued.

Right and Left were alike furious; and, to all appearance, the Council Chamber was about to be converted into an arena for the display of the "noble art." Language of an unparliamentary character was freely indulged in; and cries of "Thieves" and "We are sold" were met with "Turn them out" and "Vote." Above the turmoil rose shrill whistles produced by the application of the fingers to the mouth, much in the style common among London street boys. In vain the President rang his bell violently and used every possible means to restore order. The disturbance lasted about ten minutes; and in the end, the consideration of the amendment was deferred,

At this point, several members of the Right urged that the case of the employees should be brought forward, as had been arranged in the course of the afternoon sitting. Thereupon violent protests were heard from the Left; but the order of the day which the Council had themselves arranged was adhered to, and M. René Piault proceeded to enumerate rapidly the advantages which the Committee, in agreement with the various societies, had obtained from the new Company for the staff and workmen. The former would, he said, be placed upon the footing of the municipal officers, and the situations held would be maintained. This assimilation would be effected in moieties, commencing with the workmen whose salaries were lowest; and it would be accomplished by Jan. 1, 1906. Several amendments relating to details were adopted practically without discussion. This, however, was not the fate of a proposal by M. Rozier to reinstate, before any understanding was come to, certain workmen discharged after the strike of 1899. M. Piault explained that the existing Company would refuse, as they had already done on several occasions, to listen to any such proposition, and therefore it would be useless to endeavour to get them to entertain it. Besides, it had been arranged with the new Company that no difference should be made between the men retained in situations and those who had been discharged, when, in 1906, the present Company had passed out of existence. The Left were not satisfied with this arrangement, and called loudly for a vote upon M. Rozier's proposal. The Council, however, by the usual 40 to 38, gave priority to a counter-proposition of M. Evain, to the effect that the Committee should take this matter into consideration; and then M. Rozier's motion was lost on a show of hands. Other amendments were brought up and rejected; and by the time the clauses dealing with the employees had been disposed of, it was two o'clock in the morning.

There was, however, still a great deal of work to be got through, as the clauses relating to the kind of gas to be sent out, supplies, distributing plant, public lighting, supply to private consumers, meters, deposits, &c., had to be considered. But voting took place rapidly; and though there were signs of weariness on the part of the opponents of the scheme, its supporters seemed determined to carry it through before the close of the sitting. In fact, a motion to adjourn, proposed by the Left, was rejected, much to the annoyance of the Socialists. The first matter calling for record was the consideration of Dr. Navarre's amendment to clause 83, prohibiting the use of water gas. It was adopted under reserve; the reporter submitting that an admixture of water gas with the coal gas should be permitted in the event of the progress of science rendering it inoffensive, and of its manufacture being authorized by the Prefect of the Seine, with the sanction of the Hygienic Council. A proposal by M. Brenot, asking that the price of gas for motive power and industrial purposes should be fixed at 15 c. per cubic metre was rejected; but the Committee accepted 18 c., on condition that a special meter was used for measuring the supply. M. Félix Roussel obtained a decision to the effect that the consumers' deposits should be placed to their credit in the current account.

The Council proceeded steadily with the consideration of clause after clause, amendment after amendment, until the whole had been disposed of; and all that would then have remained to be done would have been to vote upon the scheme in its entirety, if some additional clauses had not been proposed. The first of these was submitted by MM. Desplas, Roussel, Deville, and others; and it was to the effect that all litigation, existing or in contemplation, should fall through on the signature of the new Treaty. This was adopted on a show of hands. The next was brought up by M. Veber, with the object of extending the operation of the Treaty to any outside districts that desired to come under its provisions. The third clause was proposed by M. Landrin, who expressed a wish to confer upon consumers of petroleum benefits corresponding to those to be enjoyed by the gas consumers, by abolishing, as from the year 1906, the City duty on petroleum, and putting upon the Chamon Company the responsibility for making good the annual deficit of 8,000,000 frs. in the municipal finances which this change would entail. He asked that this clause might be incorporated in the Treaty. The majority, however, were opposed to it. The Council then proceeded to vote upon the whole scheme. The result was that the report of M. Spronck and the joint Treaty were adopted by 41 votes—the whole of the Left withdrawing from participation in the final act. Subsequently, M. Landrin's proposal as to the petroleum users was referred, without discussion, to the Committee.

A few personal explanations followed. M. Labusquière set forth the position of the Socialists in regard to the gas question, and M. Félix Roussel read a declaration by his Radical colleagues. Before the Council separated, two proposals were formally disposed of. The first was one made by the Prefect of the Seine at the previous sitting, to prolong the existence of the present Company; and the other was to submit the new Treaty to the electors. Both were rejected; and the protracted sitting was brought to a close. But it was not all over with the gas question. There was the possessor of the "iron hand, carefully and neatly gloved for business purposes," to whom reference was made in our editorial columns a fortnight ago, when commenting upon this question—the "omnipotent" Prefect of the Seine—to be reckoned with. At the opening of the sitting the next day, M. de Selves stated that he disputed absolutely the accuracy of the figures brought forward by M. Sauton in opposition to his counter-project, and, as a consequence, the conclusions to be drawn therefrom. He added that he should hold himself in readiness to substantiate his statement at such time and in such place as might be necessary. Meanwhile, without criticizing in any way what M. Sauton had done, he would confine himself to bringing forward his formal reservation.

SOUTHPORT CORPORATION GAS SUPPLY.

Supply of Cheaper Gas of Lower Illuminating Power.

Last Wednesday, an inquiry was held at the Southport Town Hall by Mr. E. PIERCE BURD, one of the Inspectors of the Local Government Board, into the application of the Southport Corporation for a Provisional Order enabling them to vary the terms under which they at the present time supply gas. Among those present, were the Town Clerk (Mr. J. Ernest Jarratt), the Gas Engineer (Mr. J. Booth), the Borough Treasurer and Accountant (Mr. Lloyd), the Mayor (Mr. C. Scarisbrick, J.P.), the Chairman of the Gas Committee (Mr. Trounson), several councillors, Professor Lewes, Mr. Corbet Woodall, and Mr. J. Smallshaw, the Clerk to the Birkdale Urban District Council. The powers sought were to alter the present Act so as to provide: (1) That the illuminating power of the gas to be supplied by the Corporation may be reduced; (2) that the method of testing such illuminating power shall be altered; (3) that the maximum price per 1000 cubic feet to be charged for such gas shall be reduced; and (4) that the terms and conditions on which gas may be supplied for other than lighting purposes shall be such as may be agreed between the Corporation and the person supplied with gas for these purposes.

The TOWN CLERK, in opening the case for the Corporation, remarked that it would not be necessary to say more than a word or two with reference to the circumstances which had led up to it. The Corporation undertook to supply gas to an area of six miles round the Southport Town Hall, including, in addition to the town of Southport, the Urban District Council of Birkdale, the parish of Ainsdale, and also some places in Banks. With regard to the items of the application, the first was for the reduction of the illuminating standard. They had been supplying gas for nearly fifty years, dating from 1854, and it was rather interesting to note that the illuminating power was in the first instance 14 candles; so that the present application practically meant a reversion to the old light. The present figure was 20 candles, and was fixed by the Act of 1871, in accordance with the then fashion of having high illuminating standards. But at that time totally different circumstances existed with regard to all gas supplies. There was then practically no gas used for cooking or heating purposes, nor was there such a thing as the incandesent gas-light. It was apparently assumed without proof that the higher the illuminating power of the gas, the better it was for the consumer. Nowadays, this high power was not the factor that it was then deemed to be. First, one knew that a large proportion of the gas supplied was not used for illuminating purposes at all, but for heating and cooking. And with regard to the gas sent out for lighting, there had been a great change through the introduction of the incandescent burner, for which purpose, as they would hear by the evidence, a high candle power was not beneficial, but became absolutely wasteful from the consumers' point of view. This revolution was still going on. On the Continent, the incandescent mantle system had progressed to a far greater extent than in this country; and greater developments were to be expected in this direction. Therefore the high candle power would be more objectionable with time. The non-incandescent lighting burners now employed by consumers were absolutely unsuited for use with a high-power gas, and, rather naturally, consumers blamed the gas supply, when the fault was very largely that of their own burners. There were other reasons which might be urged—the greater loss in distribution, and the increased cost of enrichment, of which they would hear in the evidence of experts (Professor Lewes on the chemistry side, and Mr. Corbet Woodall on the manufacturing side) in gas manufacturing. Their evidence would show that it was not so much in the interests of the Corporation, but rather of the consumers, that the application should be granted. There were precedents for such an application—they could be quoted by the score; and the difficulty would be to find some for the present standard. In fact, there was only one other place in the whole country—namely, Liverpool—which had the high standard Southport was forced to comply with at present. With regard to the other items of the application, they were to fix the terms and conditions upon which gas should be provided, and that they might be such as were agreed upon between the Corporation and the persons supplied with gas for other than illuminating purposes. What they wished was to be able to supply the parties requiring gas with what they demanded. Under the provisions of the Act, they could not supply them at all, or only upon such terms as would be prohibitive to the parties requiring gas for special purposes. They asked that they might be allowed to lower the maximum price to an amount corresponding with the reduction which would be made in the illuminating power. The other item was as to the method by which the gas should be tested. This was an important item in the application. In the Act under which they now worked, they had to test the gas by a 15-hole argand burner, or other approved burner according to the provision made in the Act of 1871. This standard had given rise to a great deal of difficulty, and objections had been made with regard to it. The 15-hole argand burner was not suited to test 20-candle gas. Thus they were driven to find some other approved burner under the provisions of the Act. This meant constant friction between local authorities, such as it was desirable should be removed. Southport adopted Sugg's "G" argand burner, which was suited to the testing of 20-candle gas. At Birkdale, they preferred to use the batswing burner; and the two had given different results. As Birkdale had chosen a burner which did not come within the meaning of the Act, their tests could not be accepted as legal. The consequence had been friction which both parties wished to avoid. A further objection was that sperm candles of certain weight were insisted upon. The Corporation proposed to adopt the most up-to-date and exact standard known, and one which had been approved by the Board of Trade for the Metropolitan Gas Examiners—Sugg's No. 1 London argand. The Birkdale authority should have one of these standards fixed in their own district, and the Corporation were quite prepared to agree that there should be an independent gas examiner to make the tests, and so avoid disputes in the future. They hoped that by these means all future sources of friction would be removed. The hope was justifiable, he thought, when he announced that the two Local Authorities had been able to agree as to the various points

raised; and he had to submit to the Inspector the terms upon which they were agreed. They provided that, instead of the original intention being carried out, to reduce the illuminating power down to 14 candles at once, it should, in the first instance, be lowered from 20 to 16 candles. Secondly, that the maximum price to private consumers in Birkdale should be dropped from 4s. 6d. to 4s. per 1000 cubic feet. At current prices, there would be a reduction of 4d. below existing rates, which were 2s. 8d. in Southport and 3s. 2d. in Birkdale, with a special provision with regard to old cooking customers, who were charged 3s. in Birkdale and 2s. 6d. in Southport. Another provision for the future was that any alteration from the price above fixed should apply equally in Southport and Birkdale, and that the standard should be as in the application, except that the candle power should be stated at 16 instead of 14 candles, and the chimney in the tests should be $1\frac{7}{8}$ inches instead of $1\frac{5}{8}$ inches in diameter. Southport or Birkdale were to have full power to apply at any time to the Board of Trade to approve any burner for test purposes after giving six weeks' notice. There was a provision that the maximum price charged for lighting the public streets should be reduced by 9d., making it 2s. 9d. instead of 3s. 6d. per 1000, and that the discount allowed to private consumers under section 30 of the Act of 1871 should be continued. Another provision empowered the Corporation, under the Order, with the consent of the Birkdale Council, to reduce the illuminating power to 14 candles after one month's previous notice in writing. These terms involved some slight deviation from the application as originally intended, but, so far as possible, they were agreed to be inserted in the Provisional Order; and an agreement would be drawn up and sealed in due course. It was a matter of great satisfaction to the Gas Committee and to the Corporation generally that, by the extreme courtesy and good feeling of the Birkdale representatives and their officials with whom they had had to do in these negotiations, they had amicably arrived at an agreement which would prove not only eminently satisfactory to the consumers, but would remove a constant source of friction and irritation which had occurred in the past, and which would greatly minimize the expense of the day's proceedings.

The following evidence was then given.

Mr. *Trounson*, the Chairman of the Gas Committee, in reply to questions, said the limits of supply were six miles from the Southport Town Hall, and the extended area included Southport, Birkdale, Ainsdale, and a portion of Banks. The supply was 448 millions, and there were 11,000 consumers. He had made the application for the proposed Provisional Order. The Corporation had been fully advised, not only by their Gas Engineer, but by outside expert evidence in regard thereto.

Have the Gas Committee felt that for some time they were at considerable disadvantage by being limited by the present statutory provisions?—Yes. The provisions were very exceptional. There were only nine local authorities or gas companies who had to supply gas at even so high as 18-candle power. There was only one company, the Liverpool, which had the same standard to conform to—namely, 20 candles.

Is this application for the purpose of increasing the profits of the Corporation, or is it in the interests of the gas consumers themselves?—It is entirely in the interests of the gas consumers. We take no profit out of them whatever.

It is expected that money will be saved by the proposed reduction, and, indeed, it has been agreed to give something to the consumers in the shape of a reduction in the actual price?—Yes; we have given more than we shall save.

Proceeding, witness said the Gas Committee were entirely unanimous in regard to the application, as were also the members of the Town Council. Apart from the interests of the consumers, he considered the granting of the proposed Order was very essential to prevent further friction as between the Local Authorities in the area of the gas supply. They had been wanting it for many years. Both Birkdale and Southport had been dissatisfied; and the proposed Order would remove the sources of dissatisfaction. It was a matter of gratification to him, as Chairman of the Gas Committee, and also to the Committee, that they had been able to arrange with Birkdale the terms now submitted. He might say the Committee were highly satisfied. He put in a copy of the provisions in regard to mains in section 57 and the following sections in the Southport Extension Act of 1900. They would be carrying out in respect to mains what would be to the satisfaction of Birkdale at the present time.

Mr. D. E. Benson: Is this for the benefit of consumers? You supply gas at 3s. for lighting and at 2s. 6d. for heating?

Witness: Yes.

At what price do you propose to supply the light?—The price to consumers for heating, cooking, and power will remain as at present—2s. 6d.; but the lighting consumers will have a reduction of 4d. per 1000 cubic feet.

You agree with Birkdale to reduce the illuminating power of gas from 20 to 16 candles, and to reduce the price from 4s. 6d. to 4s. Do you call that reducing it *pro ratâ*?—No; we do not say we are reducing it *pro ratâ*.

Are you proposing to reduce the candle power and keep the price for heating at the same figure? Do you claim that reducing the price from 3s. to 2s. 8d. is for the benefit of the consumer only?

The Town Clerk (to witness): The supply to consumers for cooking and heating, except to our own consumers, who have been placed on exceptional terms, is how much?

Witness: The old consumers have gas for cooking and heating at 2s. 6d. The new consumers pay 3s. for cooking. The new consumers will be reduced just the same as the old consumers. They will get in the reduction of price a corresponding reduction of power. The new consumers have felt that the old consumers have had a supply on exceptional terms; and these, instead of being reduced, will remain as they are. As the maximum price is to be reduced 6d., this will cover the further reduction contemplated, to 14 candles.

The Town Clerk stated that the number of consumers, at the present time, in Southport was 8284; in Birkdale, 2090; in Ainsdale, 123; and in Banks, 20.

Professor *Lewes*, Chief Gas Examiner to the Corporation of London, said he had had twenty years' experience in testing coal gas, and had read many papers on the subject. During the past ten years he had strongly advocated a reduction of the candle power of gas to a point at which it could be most cheaply made from the coals obtainable by most gas companies. Formerly they had cheap cannel coal; and by mixing a certain percentage of it with the ordinary gas coal, they could make it at fairly reasonable prices, without using any of those other ingredients which gave to it its high candle power. From 1888 onwards, they had cannel coal so rising in price that its use became impossible. It was then necessary for gas managers to get power to enrich with other materials, from 14 or 15 candle power, up to the standard prescribed by Act of Parliament. There were three very practical methods of doing this. The first was by using carburetted water gas, by which it was easy to make from 20 to 22 candle gas. Mixing this with coal gas brought it up to the required power. If they did not use water gas they could enrich by the oil method, and mix the coal gas with water gas, to bring it up to the necessary power. Lastly, they could carburet the coal gas up to the required standard by mixing it with a preparation of volatile hydrocarbons. All these methods were practically an adulteration of the gas. They took good, honest coal gas, and, in order to meet the parliamentary requirements, gave it a fictitious illuminating power. Of the three methods, carburetted water gas was undoubtedly the best. Here they made it akin to the gas which most nearly approached it. The only trouble was that they increased the proportion of carbon monoxide, which, being highly poisonous, some authorities objected to. It had, however, been proved by long experience that these objections did not rest on any strong foundation; and there were no more accidents than before. Of the other methods, the oil gas was the best; and it had very fair carrying power. The benzol and gasoline enrichments were bad from every point of view. They gave a fictitious value to the gas, and that value very rapidly disappeared over any great length of main. The result was that they had a gas that was very unsatisfactory. The benzol enrichment was responsible for the differences which took place between Birkdale and Southport in the past. Now they found that if they took a good gas made from coal of the power of 14 or 16 candles, the value of it as a heating agent was, *pro ratâ*, very little less than the heating value of coal gas enriched by benzol. They could not possibly theoretically determine with any degree of certainty the value of that on the heating value of gas. It must be done by absolute experiments. He had made a very large number of experiments in regard to the heating power of Southport gas; and they showed that it might be expressed at 670 thermal units. He had also made experiments with gas of 16-candle power, which would be of the same character as that which they proposed to introduce; and in thermal units it gave 650, or a difference of only 20. The small variation was owing to the fact that a good deal of the 20-candle power was due to benzol; and, as this did not give a corresponding heat, they had only a difference of 3 per cent. in the thermal value of the two. They had at the present moment in Southport and Birkdale something like 46·3 per cent. of the gas being employed for heating and incandescent lighting purposes. The remainder was used with flat-flame and other forms of burners. The thermal value, where it was used for cooking and motive purposes, was 3 per cent. lower than that of the existing candle power gas. As regarded the incandescent mantle, 16-candle gas would be absolutely better than 20-candle. It was a very curious fact that the use of benzol enrichment did not give the same illuminating power at Southport as would be got from good, honest coal gas. A comparison of the incandescent mantle there and in London showed a considerably higher power in the latter place. When, however, the London gas was "benzoled" up to the same point as Southport, it was considerably lower. He had not the slightest doubt that incandescent gas was the light of the future. In Berlin, Leipzig, and other large Continental cities, 90 per cent. of the total lighting was done by means of the incandescent mantle. But here in England only 15 per cent. of it was so done. This was due to the sale of the mantle being at present a monopoly. When this expired, a tremendous stride forward in incandescent lighting would take place. They would then in England reach the same point which had already been attained on the Continent. It was found that with coal gas enriched by benzol, they had flat-flame burners which did not produce anything like the candle power which the special burners employed gave to the coal gas. With the argand and other patent burners, 20-candle power was shown for the Southport gas; but if they went to the consumers' houses and collected the ordinary burners, the 20-candle coal gas, which they had been going to great expense to make, gave them only from 6 to 11 candle power. There was an enormous waste in the candle power, owing to the fact that the ordinary burners were not fitted to consume the gas. The 20 was more or less a fictitious number. In the same way, when they spoke of 16-candle gas, there was a certain amount of fiction also. The 16 candle power was obtained in burners of a particular class. The ordinary flat-flame burners gave much more nearly the ordinary power with the lower than with the higher power gas. They had also the atmosphere of the room less vitiated, and they got away, to an extent, from any chance of the smoking of gas or the blackening of ceilings. The proposal he heard the Chairman of the Gas Committee make as to the reduction in price which was to accompany the reduction of illuminating power, appeared to him to be exceedingly liberal. When the South Metropolitan Company applied for their Act the year before last, they gave 1d. per candle for the reduction; but in doing this, they had in view the fact that it was practically a new departure. In order to get consumers to agree to the lowering of the illuminating power, they had to offer something excessively generous. A reduction of 1d. per candle would be a most liberal and generous reduction. With regard to the testing of the gas, to make sure that it had 16-candle power, he was most decidedly of opinion that the methods now employed in London, which had been laid down by the Metropolitan Gas Referees, really reduced the testing to an absolutely scientific basis, and gave room for little doubt as to what the candle power was. If this basis were adopted in Southport and Birkdale, they would find that the friction between the two towns would disappear.

In reply to Mr. Benson, witness said the thermal value of gas

was not exactly in proportion to the illuminating power. The power in Southport was 708 units, as compared with the proposed 650.

Mr. Benson quoted from the late Sir J. Douglass, who said that practically speaking the illuminating power and the thermal units varied together.

Witness replied that this was so, but they did not vary in the same ratio.

Supposing the gas were reduced, it would not be necessary any longer to use the water-gas plant?—That would be a question for the Gas Committee. If they reduced the illuminating power to 14 candles, no enrichment would be necessary. With Wigan coal it might be.

The results would be steadier, and not like those we have at present, sometimes very good and sometimes not so good?—Yes; it would be perfectly easy to get a good, steady gas.

In further reply to Mr. Benson, witness said if they used benzol they could enrich 10,000 cubic feet of gas with 1 gallon. It could be done for little more than 0·33d. per 1000 cubic feet. These were Continental figures, and it might cost a little more.

Mr. *Corbet Woodall* said he was generally in favour of the proposals of the Corporation. In his opinion, the arguments for a reduction of the illuminating standard were of quite modern origin. They arose almost entirely out of the introduction of the incandescent burner. He had followed carefully the observations of Professor Lewes, and agreed with him that, with so large a proportion of the gas now used for lighting purposes being consumed with incandescent mantles, enrichment was an extravagant operation, and that the consumers derived no benefit from it. With the incandescent burner, they would be absolutely losers. He confessed to a certain amount of sympathy formerly with the higher qualities of gas. When consumed in rooms, with the average ventilation of English houses and buildings, it was undoubtedly desirable that the smallest quantity of gas should be used to give the amount of light required. That being so, the better the gas the better it was for the consumer, and the better would be the condition of the atmosphere. The increased use of gas for purposes for which its illuminating value was of no consequence had been very great indeed. Perhaps the best evidence on this point was to quote a few illustrations. He took out from the accounts of the Danish Gas Company, of which he was Chairman, a statement of the proportion of gas used for lighting and other purposes for the past year. He found that in one town (Fredericksburg), in which was included a large portion of Copenhagen, only 40 per cent. of the gas was employed for illuminating purposes. The rest was used for cooking, heating, or motive power. Of the 40 per cent., at least 80 per cent. was consumed with incandescent burners. Going to other towns, he found the proportions were respectively 54, 51, 49, and 38. Turning to his experience of another company, of which he was Consulting Engineer, these figures compared very favourably. In 1892, 8·40 per cent. of the gas in Berlin was used for purposes other than lighting. The proportion went up without a break till 1900, when the percentage was 38·76. In Hanover, the percentage was, in 1892, 24·6; and in 1900, 50·1. In Berlin, the incandescent burner was in use, and the ordinary burners had been almost entirely banished from the city. Practically the whole of the gas was used for purposes to which the illuminating power contributed nothing.

Broadly speaking, you agree with Professor Lewes that for incandescent lighting 20-candle gas is very much wasted; that for cooking and other purposes it is not required; and that ordinary burners are not fitted for the consumption of a high-power gas?

Witness: I quite agree with each of your propositions. With regard to the last, there is no doubt whatever that obtaining burners suitable for the consumption of 20-candle gas is much more difficult than to get others suitable for the lower power. Consequently, the proportion of the gas wasted is much greater with the higher quality.

You also agree with the standard proposed to be set up, and that it is a great improvement on that of the Act of 1871?—Yes.

The Town Clerk: It would reduce the test as far as possible to a scientific basis, and is, therefore, as fair a standard as could be offered?

Witness: It would reduce the possibility of difference.

There is only one other point—the agreement, of which you have heard, as to the terms with Birkdale. They have not been made on your advice; but do you agree that they are fair as between Birkdale and the consumers generally?—Yes, with the qualification that where the consumer uses the gas for power there is no gain, I agree with the policy of the Committee, and that 6d. per 1000 feet is a good allowance to make between lighting and heating gas. It makes the consumer for light contribute to obtaining business by using it for other purposes.

Mr. Benson: A day user is entitled to some consideration by increasing the production and reducing the cost.

The Inspector: That is a fair argument, but it does not apply here to the same extent as in electricity. A gas company are able to manufacture evenly all through the 24 hours; but an electricity supply company cannot. If the demand is equal all through the day, but slight cost might be needed for storage. It is because of the inequality that such large storage is required. The day consumption invariably overlaps the night consumption, so that the provision as to mains, &c., has to be equal to the two.

Witness said there was one point he should like to mention, and that was the increase in the demand for gas for purposes other than lighting, which had arisen largely from the opening up of the supply to working-class consumers by prepayment meters. In nearly all cases this was now an important factor. In that of a London Suburban Company, in ten years the number of gas-stoves had gone up from 55 to 6380. He knew of another instance where they had increased from 10,000 to 16,000 in the same period.

The Town Clerk said he did not think it necessary to repeat evidence upon the same lines.

This closed the case for the application.

The Inspector: Do you not supply gas of two qualities?

The Town Clerk: No. There was an alternative application, but it never went any farther.

Mr. Benson said he desired to oppose the granting of the Order, unless some guarantee was given that the price would be reduced *pro ratâ*. He was a large consumer—indeed, one of the largest. He consumed 1,165,000 cubic feet of gas per annum, of which 222,000 feet were for lighting and 943,000 feet for heating. He saw that the total consumption in Southport was stated to be 170 millions; so that practically a million was a respectable proportion of the whole. It seemed to him, with regard to the question of lighting, that if the candle power was to be lowered, the price ought to be reduced *pro ratâ*, because if persons had to buy Welsbach burners to get as good a light as before, the effect was to put consumers to a somewhat heavy capital charge. The Corporation had told them that they proposed to keep the price for heating purposes the same, but to grant the consumer for lighting purposes a reduction of 4d. There were a good many users of gas-engines in the town, to whom the heating value of the gas was of immense importance. The remarks of Professor Lewes as to the calorific value of coal gas before carburetted water gas was used were not what he had been led to expect by the perusal of some information he had gathered from the proceedings of the Institution of Gas Engineers. Professor Lewes asserted that the thermal value of 708 units would be reduced to 650 units. If this was done, they had 60 units taken from the heating power, and consequently would have to use so much more gas.

The Inspector: How does that affect gas-engines?

Mr. Benson remarked that he used a large number of gas-irons and that kind of thing; and his point was that if the gas did not contain the thermal units, they could not get the heat out of it. They were supplied with gas at a certain price; and if it was to be diluted or of reduced quality, and they were still charged the same price when it required more to do the same work, he considered it was not fair to the consumers. Going back to the days before the introduction of carburetted water gas, they at that time had gas supplied to them at a certain price. The Corporation put in water-gas plant, and diluted the pure gas, but said nothing about the price. It was like supplying whisky-and-water, and selling it as pure whisky. There was another reason why a reduced price should be insisted upon. In 1894 or 1895, the Corporation commenced to trade in gas-stoves; and in order to induce people to purchase them, they undertook to supply gas for heating purposes at 6d. per 1000 cubic feet less than for lighting. They had led the public to purchase stoves upon this understanding, and for the same reason gas-engines had been installed, and various arrangements made for using gas for heating purposes. It was a distinct breach of the understanding to endeavour to supply an article of inferior quality without a reduction in the price. He could only regard the present application as a subterfuge, by means of which the Corporation could get an increased price for the gas; and he trusted the application would be refused, unless some satisfactory guarantee was given that the charge would be reduced absolutely in proportion to the value of the gas for the purposes for which it was to be used.

Mr. T. W. Lees, as a small consumer, endorsed Mr. Benson's request that the price should be reduced.

Mr. L. James asked that the heating value of the gas should be fixed, and that the tests for heating should be carried on as regularly as those for lighting. He thought it was also of importance that in Southport, as in other towns, the tests should be carried out by an independent person, and not by the Gas Engineer.

The Town Clerk: I have already intimated that we are quite willing to have that done.

Mr. James went on to say that if the lowering of the lighting power reduced the heating power of the gas, it meant that an unfair burden would be thrown upon a large number of lodging-house keepers—a class of the community which could ill afford to bear it. He thought that they should be told precisely what they were entitled to get, and that the efforts of the Gas Committee and the Manager should in the future be directed to securing a gas suitable for the main purposes for which it was used, as much as to producing it of a certain candle power.

Mr. Benson asked a further question relative to the dilution of the gas, as brought out by the quantity required in a gas-engine to produce a satisfactory explosion. Would it be 20 or 25 per cent. in excess of what it was when cannel gas was used?

The Inspector remarked that the higher candle power was not so well fitted for engine purposes as the lower.

Professor Lewes stated, on this point, that they might get trouble from the deposition of carbon. The candle power would give them an indication of the thermal value of the gas, and therefore of its explosive force. With the old Otto gas-engine, they would have had to employ 23 cubic feet. To produce an equivalent power with 20-candle gas, they would only require 20 feet. What they had to consider at present was the difference between gas enriched with cannel or with benzol. No doubt benzol gas was lower in calorific and explosive value, and also in its value for motor purposes. It was impossible at the present time to revert to cannel gas. They had now the various methods used for enrichment; and they were perfectly legal ones. The question for decision was as between the 20-candle gas now supplied by Southport and the 16-candle gas proposed.

Mr. Benson said they were supplied in the first instance with pure cannel gas. Then this diluted product was given to them without anything being said. Now it was proposed to take this diluted product as the basis for settlement. Prices had not altered since the days of cannel gas. The Corporation had simply diluted the gas and said nothing about it.

Professor Lewes remarked that the point had not been raised.

Mr. Benson asked if it was not the case that the gas could be produced cheaper, and that the same quality might be supplied.

Mr. Woodall said it would be a misfortune if the inquiry closed with any misapprehension as to the facts of the case or the intentions of the Committee. Taking the standard of comparison with coal gas enriched by cannel, they accepted what Professor Lewes had said would be the calorific power. The difference between the 708 under the old system and the 650 which they would have, was, broadly, only 8 per cent. This would represent something under 3d. per 1000 cubic feet. The Committee proposed to make a reduction of 4d. This was a matter of policy which must rest with them. Taking the actual difference between the gas supplied and that proposed to be supplied in future, Professor Lewes's figures came out at 3 per cent.

That would be 1d. The Committee made an allowance of 4d. The actual difference in the cost to the Committee, as nearly as possible, would be 3d. per 1000 cubic feet if they reduced the power from 20 to 14 candles. The difference would be less if it were reduced from 20 to 16 candles. In view of the incidental conditions attaching to the lower value, the greater freedom from complaints, and the much greater facility with which the gas of lower candle power could be burnt, he thought 4d. was not more than the Committee could afford; and in granting it they would be generous to the consumers.

The TOWN CLERK, replying to one or two objections, said he almost thanked the objectors for accentuating the facts to the very narrow point which, taking the consumers as a whole, they came down to. Practically the only objector, from the consumers' point of view, was Mr. Benson, representing the class who might be called the old cooking or power consumers, at present supplied with gas at 6d. less than the ordinary standard price, or 2s. 6d. per 1000 cubic feet. He must compliment Mr. Benson for being so discreet in urging his objections that he made no use of the fact that the Committee were supplying that gas to consumers at a dead-loss.

Mr. BENSON: That is your own fault.

The TOWN CLERK (continuing) said Mr. Benson knew that the cost was 2s. 5·15d. net. The consumers whom Mr. Benson represented, and who were the only ones who had any objection whatever, were the most privileged class in the whole area. They were being supplied, though the gas cost the Committee, as sent out from the works, 2s. 5·15d., at 2s. 6d., with a discount of 5 per cent., which brought down the figure to 2s. 4⅛d. This, as he had said, was a dead-loss to the Committee. Having in view this fact, they had been considering the question whether, as in many other towns, they should not raise these consumers to the same prices as they charged for their gas to the lighting consumers. All new consumers of gas for these purposes were charged the same as the lighting consumers, and were now paying 3s., except the privileged class, who could never have enough, and having more privileges than anybody else wanted still more. If they alleged this as a breach of faith by the Gas Committee, on the ground that they were reducing the calorific value of the gas without making a corresponding reduction in price, he must say that, under the terms on which the application stood, Mr. Benson and the consumers he represented would still be getting their gas at 2d. less than the other consumers for the same purposes, who had only recently started their consumption. This rather accentuated the fairness of the proposal of the Corporation. It had been suggested that the calorific value should be fixed by the Order. Calorific values were never fixed by Acts of Parliament. In the application they had made, they had complied with all precedents. He hoped that the Local Government Board would grant them the application in the form in which they asked for it. Comparisons had been made with the calorific power of the present gas and that which they proposed to send out. This was not the comparison they had to make, but rather the effect of the Order, if granted, upon the consumers whom they were supplying at present under the existing Act. They were not obliged, under their Act, and did not contemplate, to supply 20-candle power cannel gas. The Act did not compel them to supply gas of 20-candle power even by other methods of enrichment; so that the comparison, while good for the purposes of Mr. Benson's argument, was not one to be taken into account in estimating what was fair to the class of consumers he represented. Therefore, he (the Town Clerk) asked that the Inspector would advise the Local Government Board to grant the application. In conclusion, it only remained for him, on behalf of the Corporation and those represented, to thank the Inspector for the careful consideration he had given to the matter.

The inquiry then closed.

SMETHWICK GAS UNDERTAKING.

In moving the adoption of the report of the Gas Committee, at the last monthly meeting of the Smethwick Town Council, Mr. Stones mentioned that they had had a most interesting visit by the Birmingham Gas Committee, who wished to inspect the working of their inclined retorts. The visitors were accompanied by Mr. Henry Hack; and high opinions were expressed of the manner in which their works were conducted. This was all the more gratifying when they considered that these good results were obtained after three years' constant labour. With the exception of a few days in the summer, the retorts had been in continuous work, though next summer they would have to have new ones. The outlay on these would be very considerable, and the cost of the gas and the work in connection with the illuminations on Coronation Day, would preclude any idea of a profit being made. A discussion also took place upon the complaint of the bad lighting of the Cape Hill area. Mr. Stones observed that the splendid display they already had in some parts of the district, was nothing to what the Committee anticipated having. He wished to call their attention to the fact that a new system of intensified lighting had been introduced; and one large manufactory would adopt this in preference to the electric light. The lights upon some parts of Cape Hill were of this kind, and were so exceptionally good that people read newspapers under them. Yet this only represented half the light they could obtain by the method in question; and the introducers proposed placing its advantages before the public, and especially manufacturers, at an exhibition in the Smethwick Town Hall. It was a simple arrangement, which worked by water. The cost was exceedingly low—electricity was not in it. The Committee's report was adopted.

Nottingham Gas Supply.—Some extremely gratifying figures in regard to gas consumption in Nottingham have recently been made known. During the fortnight ending Dec. 28, the output was considerably over 115 million cubic feet, or upwards of 15 million feet in excess of the corresponding period of 1900. This increase was due to the extensive use of gas for fires, cooking-stoves, and engines, as well as for illuminating purposes. It is stated that there are over 10,000 prepayment meters employed in the city.

THE WORKING AND MANAGEMENT OF THE INCLINED RETORTS AT BRIGHOUSE.

A Sub-Committee of the Brighouse Corporation Gas Committee have been inquiring into the working of the gas undertaking, in regard to which there is dissatisfaction. The report is now under the consideration of the Gas Committee; but Mr. Booth, one of the members of the Council, appears to be in undue haste to get at all the facts of the matter, and he tried his best at the meeting of the Council last Wednesday to obtain an investigation by an expert. It may be that this is what the present trouble will have to end in; but until the Sub-Committee's report is presented to the Council, it would certainly have been better for Mr. Booth to have kept silent. His proposal was that an expert gas engineer should be engaged to thoroughly overhaul the gas-works, and report to the Council as early as possible. In support of the motion, he said he had again and again heard expressed, both in the Council Chamber and outside, that there was something radically wrong at the gas-works, which were not doing all that they ought to do, and that there was serious fault somewhere. Certain people said it was the management which was to blame, and others that it was the workmen. Seeing that there was such diversity of opinion, he thought it was all the more needful that the gas expert he desired should be appointed. The new inclined retort installation had cost £14,000; and the entire plant was valued at something like £30,000. The difficulties of the situation ought to have had attention long ago. He refused to believe that the members of the Committee had been quite so inactive as appearances would lead them to believe. When they found that other places could save a thousand pounds a year, it was high time that the Gas Committee were aroused to diligence. Instead of things getting better, they were really getting worse; and the Rastrick works, which had been discarded, were now showing even better results than Brighouse. The situation was certainly alarming. He wished to emphasize the fact that the reputation of the Borough Gas Engineer was at stake, and also the reputation of the Contractors.

The motion was seconded by Mr. Pickersgill, who said the Council had spent £14,000 on plant which, when erected, was second to none in the kingdom; and if it had been properly treated, it would have redounded to the credit of all concerned with it. He said at the previous meeting that the Committee had repeatedly been acquainted with what was going on; and he had said that the gas-works would never pay under the present management. He was informed that the Investigation Committee had made a report that things were improving, that there was a brighter prospect; and yet, actually last month, the return of gas manufactured per ton of coal was worse than ever. If this was "mending," it was something he failed to understand. It would be necessary that drastic measures should be taken before anything satisfactory could really be done. Every one knew, who cared to know, where the fault lay; and, knowing the fault, the remedy was ready to hand. The firm who put down the new plant expected that they would be able with confidence to bring people to see it; but, seeing the dilapidated condition into which it had fallen, owing to neglect and mismanagement, they would simply be fools to do as they had hoped to do. They were told that they had saved £3000 on the coal contracts; and yet he found the greater portion of this was gone. Instead of saving that amount this year, he was only afraid they would be much nearer being that sum behind. It was suggested to Mr. Pickersgill that it was curious he should second such a resolution, when he was prepared to tell the Council where the fault lay. It was also pointed out that the Gas Committee were really doing their best to get at the facts; and other speakers agreed that the Council ought not to take a step in the matter until they had before them the Committee's report.

To Mr. Healy, the Chairman of the Gas Committee, it seemed very strange that no one had discovered the necessity for immediate and drastic action until two months ago. He impressed upon the Council that the management of the works had not been taken out of the hands of the Gas Committee; and, whatever the decision come to, the responsibility would be equally shared. He had no hesitation in saying that, so far as the Committee had been able to ascertain, the inclined system of retorts was not at fault. The whole of the Committee were satisfied that it was a proper system, a most economical system, and, if worked as it ought to be, would produce results which were perfectly satisfactory. This being the opinion of the Committee, they did not see there was any necessity for an expert to be called in. When they had come to the conclusion as to what were the reasons the results were not satisfactory, the whole matter would be laid before the Council. Regarding Mr. Booth's statement that a neighbouring town, with a similar installation, was saving £1000 in wages, he (Mr. Healy) had had placed in his hands a statement which covered the twelve months preceding October, 1901; and he found that at Brighouse the reduction of wages alone had been no less than £925. Therefore, they were not far behind the place which had been specifically held up to their notice, and things were not quite so bad as some members seemed to have an impression they were. As he went over the works, he could see a marked improvement. The Committee had, however, had to reluctantly acknowledge that, although the new works would only have been in operation two years at the end of the present winter, fully half the retorts which had been working longest would have to be replaced. Somebody would no doubt be ready to say that this was unsatisfactory, and ask who was to blame. The Committee had not ascertained where the fault lay. They had to consider that where there was such an enormous weight of bricks and ironwork, there was a certainty that some of it would sink and warp and crack; and this would interfere with the outflow of coke. There had been a settling; there had been a serious cracking of the retorts; and the Committee could see no other way out of the difficulty than, at the end of the season, to renew these parts. It was perhaps as well to remind members that this was by no means an exceptional experience. However, surveying the whole situation, he did not see the Council need be despondent. Mr. Sutcliffe, a member of the Gas Committee, thought the inclined system was "fundamentally wrong in principle."

The motion was only supported by four members; twenty voting against it. It will therefore be well to suspend judgment until the report of the Gas Committee is before the Council.

CARBURETTED WATER GAS IN LIVERPOOL.

Important Correspondence.

The Electric Power and Lighting Committee of the Liverpool Corporation appointed, on May 31, 1901, a Special Sub-Committee to consider and report upon the use of carburetted water gas in the city. The Sub-Committee had numerous meetings, and on Nov. 26 they directed the Town Clerk (Mr. E. R. Pickmere) to write the following letter to the Gas Company's Secretary (Mr. P. F. Garnett) :—

Carburetted Water Gas.

Sir,—I beg to inform you that the supply of this gas has been again under the consideration of the Electric Power and Lighting Committee of the Corporation, who desire me to refer you to the correspondence upon the subject which took place between yourself and my predecessor in the year 1898. In a letter you wrote to Mr. Clare on March 25, 1898, you said that the Directors suggested that, pending the result of the inquiry which was being held by the Departmental Committee of the Home Office, it was expedient (and courteous) to defer the consideration of the matters relating to the supply of carburetted water gas ; and again, in a letter of April 28, 1898, you expressed regret that the Health Committee, who were then considering the matter, did not concur in your Board's view as to the propriety of awaiting the result of the then pending official inquiry.

I am desired to point out that the report of the Departmental Committee referred to was issued on Jan. 17, 1899, and notwithstanding that a copy of the City Lighting Engineer's report, which refers to the report of the Departmental Committee, was sent to your Board on Jan. 11, 1901, and that your Board were asked to favour the Electric Power and Lighting Committee with any observations which they might have to make thereon, you replied on the 28th of February following, and stated that the Board had no observations to make upon the subject; and you reminded me of the correspondence which had passed between yourself and Mr. Clare in 1898-9.

Having regard to the fact that it was your Board who suggested the postponement of the question until the issue of the report, my Committee are much surprised that the Board should have declined to discuss the subject, when that report contains recommendations which, if adopted, would minimize to a great extent the danger caused to life by a supply to consumers of this gas in large quantities.

My Committee therefore trust that your Board will give their earnest and serious consideration to the recommendations of the Departmental Committee, in conjunction with the statements and information contained in the report of the City Lighting Engineer of Dec. 28, 1900, and adopt means whereby the supply of this gas can be reduced to such an extent, and its distribution regulated in such a manner, as to render it safe and innocuous to consumers, which the Committee are advised it is not at the present time.

My Committee feel that this is a matter of so much importance, affecting, as it does, the health of a large portion of the community, that they will be glad of a reply to this letter at an early date.

On the 28th of December, the following reply was received by the Town Clerk from the Secretary of the Gas Company :—

Dear Sir,—Your letter of the 26th ult. has been submitted to my Directors, who, after very careful consideration, instruct me to state that they cannot find any reason to alter their views, as conveyed in my letter to you of April 28, 1898, and re-affirmed in my letter of May 25, 1899 (written *after* the issue of the Departmental Committee's report), and to assure the Electric Power and Lighting Committee of the Corporation that the arrangements for the supply and distribution of the Company's gas are such as to render its use as safe as that of ordinary coal gas.

I am further to observe that, at the conclusion of their report, the Departmental Committee express their opinion that, *if their recommendations were approved*, effect should be given to them by a Public Bill. No legislative measures, in pursuance of that suggestion, have been hitherto taken; and the Directors do not see their way to begin structural alterations or new works, involving large capital expenditure, until it is known what the legal requirements of the future may be.

The Sub-Committee, in their report containing the foregoing correspondence, point out that the Town Clerk, in his letter to the Gas Company, expressed the hope that the Company would give their earnest and serious consideration to the recommendations of the Departmental Committee of the Home Office, which on Jan. 17, 1899, reported upon the use of water gas ; and they go on to say that this report recommends (*inter alia*) as follows :—

That power should be conferred upon a Central Department to make regulations, enforceable by adequate penalties, limiting the proportion of carbonic oxide in the public gas supply at night to 12 per cent., or such greater amount as the Department may consider desirable. These regulations might be applicable either generally over the United Kingdom, or to any particular locality, and might contain such conditions, if any, as appeared necessary.

They go on to say that the Committee also recommended—

That powers should also be given for the regulation of the distribution and use of gas by means of bye-laws, made subject to the approval of a Central Department, and administered under local control. The matters to be so dealt with might include the following: The hours during which, or the arrangements by which, the limit imposed upon carbonic oxide should be enforced, the use in emergencies of more than the authorized proportion of carbonic oxide, the character of the gas burners, fittings, and apparatus to be used, having regard to the circumstances of their employment, the testing of the gas, and other similar questions.

The Sub-Committee conclude by saying they hoped the Gas Company would have been willing to adopt some of the more urgent measures recommended by the Departmental Committee pending general legislation on the subject, and especially, having regard to the fact that in the south end of the city the results of the analyses of the samples of gas taken in December, 1900, showed a proportion of carbonic oxide varying from 16 per cent. in the lowest instance to 18·1 per cent. in the highest, might have limited the percentage of carbonic oxide to an amount considerably nearer the recommendation of the Committee—viz., 12 per cent.—and also might, as a further temporary expedient, have intimated to the public the fact that such gas was supplied, and that certain classes of burners were more suitable for its use. Owing, however, to the unsatisfactory nature of the reply from the Company, the Special Sub-Committee suggest that the Electric Power and Lighting Committee should recommend the Council to ask the Home Secretary to receive a deputation from the Corporation upon the matter, with the view of urging upon the Government the desirability of introducing a Bill in Parliament carrying out the recommendations of the Departmental Committee.

THE PRICE OF GAS IN NORTH LONDON.

Proposed Conference.

The following report of the Public Control Committee of the London County Council stands upon the *agenda* for the meeting of the Council to-day :—

The General Purposes Committee on the 7th of October, 1901, forwarded to us for consideration a letter which had been received from the Town Clerk of the Metropolitan Borough of Holborn, transmitting the following resolution passed by the Borough Council : "That the present charge of the Gaslight and Coke Company for gas is excessive, and that the great difference in the price north and south of the Thames is a great injustice to those using gas for manufacturing purposes as well as to consumers generally ; and that the London County Council be asked to do all in its power to mitigate the injustice."

We consider the position of the gas consumers in that part of the county north of the Thames supplied by the Gaslight and Coke Company is one of peculiar hardship. Although served by the largest and richest gas company in the world, they have been compelled in recent years to pay a charge for gas much in excess of the charge paid by the consumers on the south side of the river. Their grievances have been several times represented to Committees of Parliament. A Select Committee of the House of Commons has specially inquired into the matter, and condemned in strong terms the management of the Company, and has made certain proposals with the object of securing a reduction in the price of gas. But up to the present time no effect has been given to these proposals, and the consumers have obtained no redress of their grievance against the Company. It was anticipated that the Company would have come to Parliament this session for further capital powers, and such a Bill might have afforded the consumers a means of obtaining some relief from the present unduly high charge. But the Company have not deposited a Bill, and the consumers will not have any such opportunity this year.

For the last eighteen months the charge for gas has been no less than 3s. 5d. per 1000 cubic feet, as compared with a charge on the south side of the river of 2s. 8d. up to Midsummer, 1901, and 2s. 3d. since that date. Owing to the fall in the price of coal, the Company have announced a reduction of price to 3s. as from the 1st of January, 1902 ; but this is an excessive price. The Company's consumers in the area of the south of the river, and also the Local Authorities as regards street lighting throughout the whole of the Company's district, are not subject to this high charge, because they are protected by the arrangement made in the year 1883 by virtue of which the Company cannot charge them a higher price than that charged from time to time by the South Metropolitan Gas Company, which is now 2s. 3d. for the 14-candle power gas supplied by that Company, and the equivalent price for the 16-candle gas of the Gaslight and Coke Company is considered to be 2s. 5d. This section of the Gaslight and Coke Company's consumers are, therefore, in the fortunate position of paying only 2s. 5d. for their gas while all the Company's private consumers north of the Thames, numbering upwards of 250,000, are compelled to pay 3s., and those who are supplied with gas through automatic meters have to pay the equivalent of an additional 10d. per 1000 cubic feet (they get 22 feet of gas for 1d), making a total of 3s. 10d. These higher charges constitute an additional burden on these consumers of upwards of £550,000 a year.

That the price charged by the Company is excessive there can be no doubt. The case does not rest on a comparison with the South Metropolitan Gas Company only. The Commercial Gas Company's price during the year to June, 1901, was 3s. per 1000 cubic feet, reduced to 2s. 8d. from that date ; the Crystal Palace District Gas Company charged 2s. 8d. to Michaelmas, 1900, and then 2s. 10d., reduced to 2s. 7d. from June, 1901 ; the Wandsworth and Putney Gas Company charged 2s. 6d. to Christmas, 1900, and 2s 4d. since ; and other examples could be cited. While the consumers have been paying 3s. 5d. for their gas, the Company have been distributing dividends equivalent to a rate of 11 per cent. upon their original nominal capital ; and with the price as high as 3s., they will be able to divide at the rate of 12¼ per cent.

The Council, in the action which it has already taken with a view to getting some reduction of the excessive charge for gas, has been working in full harmony with the Corporation of the City of London, and has been supported by all the Local Authorities concerned. Two conferences of local bodies were held in the autumn of 1900—one convened by the Council and the other by the City Corporation. The resolutions passed at both conferences were similar in their main purport, and showed that there was undoubtedly a very strong and practically unanimous feeling throughout the large area on the north side of the Thames served by the Gaslight and Coke Company against the excessive price charged for gas.

No redress having been obtained from the Company by the consumers of gas north of the Thames, we have considered what action should be taken by the Council ; and we directed the Comptroller to report what further steps the Council could take in the matter. The Comptroller has now reported on the subject ; and as we endorse the views set out in his report, we have directed a copy to be forwarded to each member of the Council.

We are strongly of opinion that the time has now arrived when another conference of the Local Authorities interested should be called to consider the matter. We recommend : "That the Public Control Committee be authorized to convene a conference of representatives of the Corporation of the City of London and the Metropolitan Borough Councils in the district north of the Thames supplied by the Gaslight and Coke Company, to consider the present high price for gas charged by the Company and matters incidental thereto, and the course to be adopted to obtain a reduction of the price."

On Monday of last week, a shipwright named John Stephens was found dead in bed at New Brompton, having been suffocated by gas. The tap had been left on during the whole of the previous night.

THE FATAL EXPLOSION AT HYDE.

A report appeared in the "JOURNAL" for the 14th inst. (p. 103) of an explosion at the Slack Mills, Hyde, by which a man named Henry Brierley, in the employ of Messrs. J. & J. Braddock, lost his life. It was stated that the inquest, after being opened, was adjourned, in order that the Coroner might communicate with the Home Office. The inquiry was resumed on Monday last week, when Joseph Higginbottom, a fitter in the employ of the Hyde Gas Company, who was working with the deceased, said that at the time of the accident the job was finished, with the exception of putting the requisite quantity of water into the meter. The inlet-valve was closed, and the outlet was open. At the back of the meter there was a small hole to regulate the water; and this also was open. It was about ¾ inch in diameter. Witness struck a match while standing in front of the meter, for the purpose of discovering a leakage of water. The match while alight was placed at the bottom of the meter; and when it was spent, witness dropped it on the floor. The explosion took place some seconds afterwards, and Brierley was killed instantaneously. Deceased was struck with something about the head; and witness thought he was bending down at the time to look for the leak. Witness struck the match on Brierley's instructions. Mr. Thomas Newbigging, M.Inst.C.E., who was next called, said he had examined the meter, which was of an unusually large size. It was the custom, when repairs could not be executed within a reasonable time, to make a temporary connection to carry the gas into the mill. This had been done on the present occasion; but the temporary pipe had been removed at the time the explosion occurred. It was possible that the gas could have got into the meter by coming back through the pipes from the mill. Witness did not think the match could have had anything to do with the explosion. There was a gas-jet on the wall behind the meter—the distance from the light to the open pipe at the back of the meter being about 4 feet; and his view was that the accident was caused by the gas escaping from the plug-hole being fired by the gas-jet. About 3½ cubic feet of gas would be sufficient to make an explosion in the drum; and there was room for 30 cubic feet. He thought the former amount of gas could have come back from the mill to the meter. What should have been done was to use an electric lamp instead of the gas-jet. From what witness had heard, the deceased's actions were consistent with his being an experienced man; but there should not have been a lighted jet near the meter. The Coroner, in summing up, expressed the opinion that the explosion was caused by the gas returning from the outlet-pipe into the meter, coming into contact with the air there, and travelling to the lighted jet about 4 feet from the plug-hole. The deceased should have protected himself by making other provision for light. He understood that electric lamps were provided by Messrs. Braddock; and it was a mistake for deceased not to have brought one with him. The Jury returned a verdict that Brierley died from fracture of the skull, resulting from the bursting of a gas-meter caused by an accidental explosion.

THE PROFIT-SHARING QUESTION.

The following further letter on the above subject from Mr. Livesey appeared in "The Times" last Wednesday:—

Sir,—May I suggest that the invaluable articles on "The Crisis in British Industry" should be published in pamphlet form for distribution by employers and others among workmen, of whom, I am sorry to say, large numbers do not see "The Times?" Copies should also be placed in all libraries and reading-rooms, &c. I would gladly do my part in the circulation.

May I add a few words on the question of profit-sharing? You will, perhaps, be surprised to hear that in simple profit-sharing—the periodical distribution of a cash bonus—I have no faith. It does no permanent good to the vast majority of recipients, and to many it works positive harm. Two objects of equal importance must be constantly kept in view—viz., to create in the workman an interest in his work and to enable him to permanently improve his position in life. To attain these objects, profit-sharing is only the first step, and by its means both may be accomplished if the bonus is paid partly or entirely in shares at the market price. The worker thus becomes a shareholder or a partner; and profit-sharing is the only practicable means to secure this desirable end. This, I venture to say, is not the kind of profit-sharing which "so disgusted" your correspondent Mr. Browett; but it is that which has been successful in the South Metropolitan Gas Company and equally so in certain private firms and limited companies where profits fluctuate, which I could name. It is a common occurrence with us to be told, with evident pride and pleasure, by a workman, that he has £100 or more in the Company, and that prior to the introduction of the profit-sharing share-holding system he could never save a penny. Some 3000 men now have about £145,000 in the Company, and many have bought their houses besides. The logical outcome of the system is a share in the management, which has been given to the employees, who now have three of their number—two workmen and one clerk—sitting on the Board; and I can assure you no question of mastery has arisen, or in my opinion can arise, between such partners in the business.

You may also be surprised to hear that, successful as the system has been here since 1889 and at the Crystal Palace District Gas Company since 1894, gas companies are quite as slow as other employers either to adopt it or to attempt anything else in the same direction. General apathy and want of will are the real difficulty. I may add that within the last year our system has been adopted by the Newport, the Chester, and the Commercial (London) Gas Companies.

Industrial Undertakings, Limited, has been registered with a capital of £20,000 in £1 shares (10,000 preference) to acquire and carry on industrial, commercial, manufacturing, and financial business generally, to establish and maintain railways, tramways, electric light, gas, water, and hydraulic works.

ELECTRIC LIGHTING NOTES.

An Electricity Exhibition Abandoned in Consequence of the Depressed State of the Industry.

A projected Electricity Exhibition, which was to have been held in Vienna in 1903, has now been abandoned, on the recommendation of the Committee which had been appointed to make the preliminary arrangements. The chief ground of the Committee's recommendation was the present depressed state of all branches of electrical industry.

Electric Lighting in the City of London.

The first step taken in this matter since the Special Committee reported to the Corporation that they were unable to continue negotiations with the City of London Electric Lighting Company, Limited, was the receipt, at a recent meeting of the Common Council, of a letter from the Company, reiterating the request that the Corporation will decide, without further delay, whether they desire the Company to continue the lighting of the main thoroughfares in the central and western districts, in respect of which the Court of Appeal has decided that no agreements exist between the Company and the Corporation. The communication was referred to the Streets Committee for consideration and report. The Corporation will be asked, at their next meeting, to appeal against the judgment that the contract between them and the Company for the lighting of the eastern district is valid.

Profits and Reduction in Price at Liverpool.

The Liverpool Electric Power and Lighting Committee, finding that for the year 1901 they have a surplus of £24,000 to dispose of, have decided to devote £7500 to the relief of the rates, and to carry the balance (£16,500) to the repairs and renewals fund. In the previous year, the revenue account showed a profit balance of £47,478; and of this sum, £26,148 was required for interest, £17,833 for sinking fund, and £3496 was carried to the renewal account. The sum which it is now intended to apply to the relief of the rates, is only equal to about ⅝d. in the pound on the rateable value of the city; but, in addition to this, the charge for lighting is to be reduced, after the end of the present quarter, as follows: Up to 3000 units per quarter, 3½d.; beyond this amount, 3d. per unit. The other prices charged for energy will remain the same as now. The present price for lighting is 4d. per unit, without any concession for quantity. No reduction has been made for power, which remains at 2d. per unit up to 3000 units, and 1½d. per unit beyond.

Electric Lighting and Settled Estates.

The current number of the "Builder" contains a reference to a decision of some importance given in the case of *Kinnaird v. Treake*, and noticed in the last number of the "Official Reports." The following is the point: By the Settled Land Act, 1890, capital may be spent on additions to the estate which are reasonably necessary; and the question arose whether capital sums could be expended on an electric light installation on a number of London houses in South Kensington. It was given in evidence that the houses in question were all unlet; and in order to meet modern requirements, it was necessary that they should be fitted with electric light. The application was granted by Mr. Justice Joyce on the ground that the system of lighting fell within the words of the statute. But he confined his sanction to the wiring of the houses, and would not extend it to fittings such as are usually provided by a tenant. Our contemporary thinks that probably the same point will arise, sooner or later, in regard to country houses, which seem to be on a somewhat different footing.

A Reputation at Stake.

At the last meeting of the Nuneaton Urban District Council, the Electricity Committee recommended the borrowing of £5000 for works in connection with the electric light undertaking. Mr. L. Knox asked if any estimate had been made as to what would be the probable income from such an expenditure. They had, he said, already raised £18,000 in connection with the undertaking, and for this they had to pay about £1200 a year. If they borrowed the sum suggested, it would make a total of £23,000. The gross revenue of the concern was something under £1200 a year; and they were spending about £2000 per annum. Mr. Bates (the Chairman of the Electric Committee) said the £5000 was not asked for with the idea of spending it straight away; but they could not conduct a growing business without increase of capital. The Committee did not intend to carry out any new work that did not show an absolutely certain prospect of paying its way. He would stake his reputation that the undertaking would pay within one or two years from now. It was decided to adopt the Committee's recommendation.

Objections at Slough.

The Slough Urban District Council having applied to the Board of Trade for an Electric Lighting Order, the Gas Company, who are offering strong opposition, have filed a list of seventeen objections. They contend that a large portion of the area is of a rural character; and that the lighting requirements are sufficiently provided for by them. The Company also say that the application is unreal; it being intended to hand over the order to a company, and thereby to contravene the spirit of the Electric Lighting Acts and the orders of the Board of Trade relating thereto. It is pointed out that only last year the Gas Company obtained power to raise additional capital for the purpose of constructing further works, whereby the whole district will be efficiently supplied with gas for some years to come; that the original works in the heart of the town will be transferred to an outlying part of the district; and that the Council were represented before the Board of Trade when the Company applied for power to raise the capital and construct the new works, and no announcement was then made of the intention of the Council to undertake lighting by electricity. The Company then go on to urge that full opportunity should be afforded to the ratepayers to express their views, before the Council are allowed to embark upon the proposed undertaking. At present there is no evidence, by public meeting or otherwise, that there is any general desire for such an Order. We can only wish the Gas Company success in their

self-imposed task of championing the cause of the ratepayers of Slough and Datchet.

Tiverton Water-Power Scheme.

Tiverton is still of two minds respecting the proposed electric lighting scheme, which, if carried out, would utilize the waters of the River Exe as motive power. Mr. W. P. Adams, the author of the scheme, originally fixed the cost at £4210; while according to another estimate put forward by Alderman Amory, it would be not less than £18,450. A meeting of these gentlemen resulted in an understanding that Mr. Adams's figures should be increased to £11,649, and those of Mr. Amory reduced to £15,050. The objection to the scheme, however, goes farther than this; for it is contended that the water power would be insufficient. Mr. Adams calculated that in November there was a sufficient flow to maintain 5600 8-candle power lamps; and he said that when the demand approached 5000, it would be desirable to put down a gas-engine as auxiliary plant. If not available for the whole output, the water power would, he contended, always be a valuable asset. If there were 10,000 lamps, the gain to the town through having a water-driven instead of steam-driven plant would be £700; while there would be a saving of £5000 in the initial cost. With 2600 lamps connected, he estimated the net profit at £146. Even this brilliant prospect did not prove alluring to Alderman Amory. The scheme, he argued, was thoroughly impracticable, for the reason that the fall of water was insufficient. The installation was to cost £12,000; and this would only provide for fifty consumers, light one-tenth of the gas-lit area, and one-fifth of the streets. He wanted the Council to abandon the scheme then and there; but it was decided, by a small majority, to submit it to an engineer with special knowledge of hydraulics and electricity.

The New Electric Light Station at Exeter.

An estimate of the total cost of the new electric light station at Exeter was laid before the City Council on Wednesday last. The Council recently decided to accept the tender of the Westinghouse Company for the equipment of the station, for the sum of £29,707. This is, however, less than one-half the total cost. The estimate as presented amounted to £69,862 13s. According to the Chairman of the Committee, this provides for all contingencies. Next to the equipment, the largest item is the buildings, which, with land, railway siding, &c., are to cost £17,896. The cost of main feeders for the new station, and of main extensions, is put down at £12,530; and among other large items is that of boilers, mechanical stokers, sub-stations, transformers, meters, and alterations of existing motors, lamps, meters, and transformers. Application is to be made to the Local Government Board for power to borrow £70,000. It is a considerable expenditure for Exeter—equivalent, as is pointed out, to a rate of 6d. in the pound. Still, it was not unexpected. When they bought the undertaking of the old Company, the Corporation knew that they would shortly be called upon to build new works. Whether the outlay will be justified by the anticipated great demand for electric lighting, remains to be seen. And whether the new electricity undertaking is a financial success or otherwise, the citizens of Exeter have certainly a right to expect that it will result in an improvement of the lighting of the streets in which arc lamps are fixed. Complaints of the unsatisfactory performances of the present lamps are periodic. One member of the Council suggested last week that the lamps suffer from heart disease or spasms, and that their erratic behaviour is chronic. The official explanation was that it is the fault of the old machinery; and it was said, in excuse, that it would be folly to spend money on tinkering this plant. The lamps are therefore to go on winking, and occasionally refusing to yield light, until the new station is built and in working order.

No Need for Cynicism?

The Uxbridge and District Electric Supply Company have so far proceeded with the work of fitting up their installation, that the end of next month, we learn, "may see them in a position to afford the town electrical power and illumination." We trust the town will be in a position to "afford" the luxury which the Company will offer them. In the course of a long and laudatory article, the "Middlesex and Buckinghamshire Advertiser" remarks that they have heard the typical Uxbridge man described as of cynical temperament, "an impeachment which does not apply in this instance." Perhaps not—at present; but it may do so later on. The charges for service in the Uxbridge urban district are to be on the maximum demand system, at 7d. per Board of Trade unit for the first hour per day, and 3d. for the second and subsequent hours; and when the bills, made out on this charmingly simple plan, begin to come in, we venture to think the inhabitants will find ample scope for their traditional cynicism. Our contemporary remarks that "to many people who have not enjoyed the blessing of a technical education, unit is a mysterious word; and in endeavouring to compare the cost of electric lighting as against gas, they are thereby perplexed," How many consumers of electricity there are who must be deficient in "technical education"—for this perplexity is by no means uncommon among those who have had experience of the "unit!" However, the article before us gives an instance of the sort of bill the consumers may expect to receive, and concludes with a table showing how the cost of electricity diminishes with the lengthened daily use of the light, and how such cost compares with that of gas. The basis taken is an average of 30 watts per hour and 8-candle power electric lamps, as against a consumption of 3½ cubic feet of gas per 8-candle power gas-burner per hour. The price of gas is put at 3s 11d. per 1000 cubic feet; and that of electricity on the sliding-scale mentioned above. From this table, it appears that, if the light is burning for an average of two hours a day, the cost per annum will be 8s. 10d. for electricity and 10s. for gas. Thus, even on so small a consumption, a substantial saving is promised to the user of electricity. Owing to the sliding-scale, however, this saving increases in greater proportion than the number of lighting hours, until, if a consumer should have a fancy for keeping a light going continuously day and night in (say) his coal-cellar, it would only cost him £3 9s. 2½d. for electricity, against £6 for gas. For such a purpose, therefore, the use of the electric light is undoubtedly to be recommended. The odd halfpenny should give the would-be customer confidence; for who could doubt the accuracy of figures worked out to such a fraction?

GRAND JUNCTION WATER-WORKS COMPANY.

A Special General Meeting of the proprietors in this Company was held last Wednesday, at the Offices, South Molton Street, W.—Mr. F. TENDRON in the chair—to consider the Bill proposed to be introduced into Parliament this session to empower the Company "to extend their limits of supply, to acquire additional land, and to raise further money; and for other purposes."

The SECRETARY (Mr. John Goodwin) having read the notice calling the meeting,

The CHAIRMAN, gave a brief outline of the clauses of the Bill. He stated that clause 4 asked for powers to supply Sunbury, in Middlesex. This district was supplied by the Company at the present time; but without parliamentary powers, which the Directors thought it was better that they should now possess. Clause 5 gave them power to acquire, by agreement, up to 20 acres of additional land; and similar powers for obtaining easement rights or privileges were granted to them by clause 6. In clause 7, powers were asked for to sell or lease, under conditions, certain properties belonging to, but not required for the purposes of, the Company. Special reference was made to part of the property which the Directors thought it might be greatly to the Company's interests to sell—it having increased so very much in value, that all their requirements might be carried out probably at far less cost than the amount they would receive by the sale of the property in question. Clause 9 required the money thus obtained to be used solely for capital purposes. Clause 11 incorporated section 89 of the Companies Clauses Consolidation Act, 1845, with regard to any vacancies that occurred on the Board, and the mode of filling them up. Clauses 12 to 20 authorized the issue of an amount of 3 per cent. debenture stock that would give the sum of £200,000. At the general meeting held last December, he explained the financial position of the Company. He showed that they had a small amount in hand after raising the balance of the "D" stock, and that they also had £15,000 of 4 per cent. debenture stock to issue. They had no working capital, however; and in connection with main laying, there were some heavy works in hand. It was therefore desirable to take powers to raise a sum sufficient to carry the Company on for a reasonable number of years—really for current work chiefly, and for working capital. Clause 21 bound the Company to the provisions of any General Act relating to the Metropolitan Water Supply. Having expressed his readiness to answer any question, or to give any further explanation that might be desired, the Chairman concluded by proposing a resolution approving the Bill, subject to such additions, alterations, and variations as Parliament might think fit to make therein, and as the Directors should approve.

The Right Hon. Viscount KNUTSFORD seconded the motion.

Mr. MAKINS said he had no doubt that the Bill was a very proper one, and that what the Directors proposed was justified. He doubted very much, however, whether there was the slightest chance of the measure passing this session. Mr. Long's Bill, he presumed, would take precedence of any measure such as theirs; but that Bill so far had not been published, and there was doubt if time would be found to pass even this measure. In that event, he desired to know what position the Company would be in as regarded the Bill before the meeting. Was it absolutely necessary to them, or could they go on for another session, supposing there was no time to pass the Bill? Were they, in that event, sufficiently fortified as to capital and other matters?

The CHAIRMAN, in reply, stated that Mr. Long's Bill was very different to that proposed by the Company. The latter would probably be referred to some Committee; and in view of the fact that the works which the Directors desired to carry out were necessary for the proper conduct of the Company's business, he could hardly think that a Committee would object to giving them the powers which were asked for. At all events, it would not be very long before the shareholders would be invited to tender for the £15,000 of 4 per cent. debenture stock mentioned; and this would help the Company for a time. In any case, they must do their duty and ask for the powers set out in the Bill; but if Parliament did not grant those powers, and people did not get supplied with water in new districts, Parliament alone would be to blame.

The motion was carried unanimously; and the meeting ended.

THE SECOND PIPE LINE FROM VYRNWY.

Meeting last Wednesday, the Liverpool City Council dealt with an important matter affecting the water supply of the city. It was a recommendation of the Water Committee that the laying of a second line of pipes from Vyrnwy to Prescot, at an estimated ultimate cost of £785,000, be proceeded with, and that the Engineer be instructed to prepare forthwith specifications, &c, for the immediate commencement of the section between Norton and Prescot, at an estimated expenditure of £116,000. The approximate annual amount required to meet the charge for sinking fund and interest on the £785,000 was £32,289, and on the £116,000 £4771. The adoption of the report was moved by Alderman Burgess, who stated that the Vyrnwy scheme provided for three lines of pipes; but only one of these had so far been laid. They had now come to a time when the increased consumption of water rendered the construction of a second line of pipes imperative; and the Committee confidently anticipated that no addition to the water charges would be needed to furnish the increased supply. For three or four years, it had been evident that the time was approaching when the work must be undertaken; and so long ago as 1889, the Committee passed, and the Council approved, a resolution authorizing the Water Engineer to prepare plans and estimates for the construction of a second pipe line from Vyrnwy to Prescot. The water supply of Liverpool was derived from three sources, from Rivington, from Lake Vyrnwy, and from wells, yielding an utmost capacity—from the wells 5 million gallons daily, from Rivington 11 million gallons, and from Vyrnwy, through one line of pipes, 15 million gallons, though the ultimate delivery of each Vyrnwy pipe was intended to be 13½, and not 15 millions. They had thus at the present time, on a very

liberal computation, 31 million gallons daily at their command. From this, however, must be deducted 2 million gallons which were supplied to various places on the pipe-line at remunerative prices, which left them with a total net quantity of 29 million gallons. The actual average daily consumption of water during the year 1901 was 26,200,000 gallons. The average annual increase since 1895 had been 500,000 gallons daily; and besides this, the variable circumstances of summer and winter had to be considered. During the recent severe weather, the Water Department had to deal with no less than 1600 burst pipes in Liverpool alone. It was necessary, therefore, to take into consideration not only the normal consumption, but the maximum requirements, which were 20 per cent. greater than the ordinary daily average. They had thus to provide for a maximum average of 31 millions. The highest consumption for one day in 1901 was 36,840,000 gallons. These maximum demands had to be provided for. It was intended to proceed with one section immediately—that from Norton to Prescot, a distance of about 9 miles. The total length of pipes from Vyrnwy to Prescot was about 63 miles. There were six sections varying in length from 6 to 17 miles, the lengths being separated from each other by balancing reservoirs in such a manner that each length acted quite independently of the other. The length from Norton to Prescot was the nearest to Liverpool, and the Engineer had no doubt that this section should be first proceeded with, as it would enable the Committee to obtain an increased supply at once without waiting for the completion of the other divisions. The entire line could not be finished in less than three or four years. As to the financial aspect of the proposal, under the Vyrnwy Act the Corporation were authorized to borrow £3,250,000 for the construction of the works. Of this, about £800,000 was expended in bringing the first instalment of water; this amount, of course, including the construction of the dam and tunnels and the purchase of land and other things which did not recur in connection with the second instalment. The estimate now before the Council included the pipes, pipe-laying, filtering-beds, reservoirs, and everything needed for the second instalment of water. Although what the Council were asked to sanction that day was work estimated to cost £116,000, involving an annual expenditure for interest and sinking fund of £4771, it was just as well that it should be clearly understood that, if a portion of the second pipe-line was undertaken now, the rest must follow, and for this the estimate was £785,000, involving an annual charge of £32,289. It was, however, as certain as anything reasonably could be that no addition to the water charges would need to be made to cover the interest and sinking fund on the new works. After a short discussion, there was a unanimous vote in favour of the recommendation.

GLOUCESTER WATER SUPPLY.

Local Government Board Inquiry.—A Noxious Weed.

A Local Government Board inquiry was held at Gloucester last Friday week, for, among other objects, sanction to borrow £5820 for water-works purposes. The Town Clerk (Mr. G. Sheffield Blakeway) explained that the sum mentioned was made up of the following items: Cost of providing filters at the Witcomb and Robinswood Hill reservoirs, £5500; cost of providing mechanical stokers for the boilers at the Newent Water-Works, £320. The filters were required for the purpose of dealing with a certain amount of sediment which had been found in the water, and for removing the annoyance caused by weeds which grew in the reservoirs at certain periods of the year, and gave to the water a fishy taste and smell. Messrs. Bell Bros., the Contractors for supplying the filters, had given a very strong guarantee in writing as to the efficiency of the plant; and there was every reason to believe that the results would be thoroughly satisfactory. He (the Town Clerk) desired to impress upon the Inspector (Mr. W. O. E. Meade-King, M.Inst.C.E.) the fact that the need for the filters in no way arose from any anxiety as to the character of the water, but was solely caused by the sediment and the fishy smell and taste. The annoyance from the weeds was only experienced in certain months; but while the fishy smell had been a source of very great trouble indeed, the people of Gloucester knew the cause, though they might not like it. Strangers, however, who visited the city at the period of the year when the weed became offensive, and who did not know the reason why the water had that smell, might not unnaturally become suspicious as to its character; and hence the decision, after due consideration, to establish the system of filtration referred to. The City Analyst (Mr. G. Embry) said he believed the proposed filters would be quite sufficient for the work required of them at Gloucester. He had for many years made regular analysis of the water; and he knew that the trouble had been from the sediment and the weed. The inquiry then concluded.

LLANDRINDOD WELLS WATER-WORKS ARBITRATION.

On the last two days of 1901, at the Surveyors' Institution, London, there was an arbitration to decide the amount to be paid by the Llandrindod Wells Urban District Council for the undertaking of the Water Company, which the Council have acquired under their Act of last session.

Mr. CHARLES HAWKSLEY was Arbitrator for the Company; and Mr. JAMES MANSERGH, for the Council. Sir GEORGE B. BRUCE was Umpire. Mr. BALFOUR BROWNE, K.C., Mr. CLAUDE BAGGALLAY, K.C., and Mr. HERBERT SMITH appeared for the Company; Mr. WEDDERBURN, K.C., for the Urban District Council.

Mr. BAGGALLAY, in opening the case, said the water undertaking was started in 1873 by Mr. Middleton Evans, a landowner in the district, as a private undertaking for the development of his estate. In 1884, the works were taken over by a Company, incorporated by an Act passed in that year, with a share capital of £5000 and borrowing powers to the extent of £1500. In 1889, and again in 1893, Provisional Orders were obtained by the Company (which were subsequently confirmed), under which further powers were conferred upon them and their capital increased—in 1889 by £1000 in shares and £500 in debentures, and in 1893 by £1000 in shares and borrowing powers of £250. Of this authorized capital, all the £5000 in 1884 had been raised on shares with a 6 per cent. maximum dividend. Of the capital authorized by the Order of 1889, a sum of £815 had been raised on shares; and as these were issued under the auction clauses, a premium of £166 had been received. These shares were issued as preference stock, bearing a dividend of 6 per cent. No part of the capital authorized by the Order of 1893 had been raised. Of the loan capital, all had been issued except that authorized in 1893. Counsel then put in a series of tables which had been prepared by Messrs. Lass, Wood, and Drew; and he next proceeded to consider the Purchase Act of 1901. Under section 3 of the Act, the Council had to purchase the undertaking of the Company, with all its rights, powers, and privileges. He called attention to this, because part of the powers exercised by the Company were not authorized by Act of Parliament. But the Act made no distinction, and took the Company as *de facto* existing. Then the Council were to pay a sum for compulsory sale, and the costs of the Act of 1884 and the subsequent Orders. There were two provisos which were important—that the Arbitrators should have regard, first, to the undeveloped state of the undertaking, and to the probable development of the district; and, secondly, to the fact that the water-rentals were based upon the valuation list, and not upon the rack rental. Besides, the Company were to be entitled to treat as capital all sums expended for capital purposes; and these sums largely exceeded the amount of capital raised by the Company. The district of the Company's supply was largely and rapidly increasing in population. This had risen from 784 in 1891 to 1828 in 1901; and according to a census taken in 1900, the number of people resident in the town was 6800—the number of visitors being nearly 5000 during the season. What they had to consider was whether there was sufficient water for these 6800 people, and if so what margin existed for any future increase. Before 1884, the Company got their supply of water from certain springs; but as the district grew and the demand increased, they in 1889, without statutory authority, went to the River Ithon and obtained water from that source. At the present time, they had a minimum supply of 16,000 gallons daily from the springs, and a maximum supply of 124,000 gallons from the river. The pumping power was largely in excess of their requirements, and the water was sufficient in quantity and of excellent quality. He would satisfy the Arbitrators by evidence that the revenue of the Company was well secured, and that the works were sufficient to supply the population, even if it were largely increased in the future.

Mr. *Samuel Wood*, of Messrs. Alfred Lass, Wood, and Drew, was the first witness. He said he had gone through the books of the Company since 1884, and produced tables of the results of his investigations. Table A showed the total amount of authorized and issued share and loan capital; £7000 ordinary share capital being authorized and £5981 issued, and £2250 loan capital being authorized and £2000 issued. To pay the maximum dividend on the shares, an annual sum of £348 was required, besides £100 interest on the loan. Table B was a statement of the capital expenditure of the Company. Including £4294 19s. 4d. the costs of Act and Orders, £2144 13s. 3d. the purchase price of the undertaking, and £7254 11s. additional expenditure on works and mains, the total expenditure had been £13,694 3s. 7d., or £5713 in excess of the Company's capital receipts. Table C gave the revenue account for the two years 1899 and 1900, from which it appeared that the gross receipts from water-rentals had been in 1899 £775 12s. 8d., and in 1900 £1035 7s. 1d. Deducting from these the ordinary working charges, interest, and the cost of the abortive Bill of 1900, there had been a deficiency of £222 9s. 10d. in 1899, and of £888 14s. 11d. in 1900—the total deficiency to Dec. 31, 1900, being £1837 9s. 7d. Table D was the balance-sheet; and Table E gave the approximate water-rental for the present year as £1101 18s.

In cross-examination, witness said the books had been curiously kept. He had never seen books so kept before. He had no evidence as to the law costs in relation to the Bill of 1884. There was an average loss of about £70 per annum on the undertaking; and the Company had never paid any interest on their ordinary shares. The water-rents had been very carelessly collected; and at the present time a sum of £1617 was due.

Mr. *W. N. Swettenham*, the Engineer to the Company, generally corroborated the statements of Mr. Baggallay as to the history of the Company. In July, 1889, the Company put down a pumping-station, and took water from the River Ithon. The water was rather turbid, but after passing through the filter-beds it was good. In 1898, they put down a second pumping-engine. Each was guaranteed to pump 5000 gallons an hour; and one engine did all the work which was necessary. The water was pumped from the river to the reservoir, from which it passed to the filter-beds. The additional filter-beds which had been recommended in the inquiry of 1900 were now almost completed. They had sent samples of the water to Dr. Dewar and Dr. Stevenson. Dr. Dewar had reported that the water was a turbid peaty river water, which after proper filtration would give a good potable water; and Dr. Stevenson had reported that the water was not polluted, and, if properly filtered, would be excellent. All the pipes and mains were very good and clean, though some of them had been laid down for nearly thirty years.

In cross-examination, witness said up to 1884 the sole supply had been from the springs. From these they still drew a small amount; but the bulk of the supply was from the river. In 1889, when they put down their pumping-station, they had no parliamentary powers to take any water from the river. In 1893, the report of Major Marindin was that, as a river supply, the water was not objectionable; but, in his opinion, it was desirable that the supply should be in the hands of the District Council. In the report presented by the Local Government Board on the Bill of 1901, the Board stated that the supply was inadequate in quantity, and the quality open to serious complaint.

Mr. *George F. Deacon*, Consulting Engineer to the Company, was next called and examined by Mr. BALFOUR BROWNE. He gave a history of the progress of the Company, and stated that, although there had been complaints of want of pressure, on examining the houses he had found none in which there was not a surplus pressure. The Company fully complied with all the requirements of the Water-Works Clauses Acts.

He gave a description of the works in 1900, when he was called in to advise the Company. They consisted of a pumping-station with two engines, each capable of pumping 110,000 gallons per day with ease. The boilers were each capable of supplying power to more than one engine. The pumping-stations were in such a position that the water could not be contaminated. The water was obtained from a well which was sunk in the boulder clay, and supplied to the well by pipes from the river. The works were sufficient for the supply of a larger population than at present existed, even during the busiest time of the summer. The only defect was the coal bill. There was a rising main, consisting of a 4-inch pipe, which was sufficient now; but the pumping-station would supply more water than this main could carry. When he was called in, he advised the Company that the works were sufficient as to sedimentation and filtration. They decided to convert the old filter-beds into sedimentation tanks, and to make new filter-beds. These works were now completed and in going order. Mr. Deacon then presented his valuation as follows:—

Maximum dividend on paid-up capital	£348 18 0
Which, at 33¼ years' purchase, represented	£11,630 0 0
Add 10 per cent. for compulsory purchase (by Section 6 of Llandrindod Wells Water Act)	1,163 0 0
	£12,793 0 0
Add capital expenditure in excess of capital receipts	5,713 3 7
	£18,506 3 7
Add back-dividends, 6 per cent. on £5000 capital raised in 1892 = £300 per annum, for ten years	3,000 0 0
	£21,506 3 7
Add premiums	166 0 0
	£21,672 3 7
Add loan capital	2,000 0 0
Total	£23,672 3 7

The following statement in regard to net revenue was handed in:—

Water rental, calculated in rateable value	£719 1 6
Extras: Meter supplies, &c.	681 16 0
	£1400 17 6
Increased rent obtainable from the Pump-House Hotel	121 10 0
Total gross revenue	£1522 7 6
Deduct expenditure in 1900	700 8 7
Net revenue	£821 18 11

In cross-examination by Mr. WEDDERBURN, witness stated that the structural valuation had nothing to do with the matter. Various suggestions as to alteration of the figures were made, foreshadowing the case for the Council, but were not accepted by Mr. Deacon.

Mr. WEDDERBURN: Originally, when the undertaking was purchased in 1884, the price was £2000; and that would include something for structural value?

Witness: I have not gone into that matter at all.

In re-examination by Mr. BALFOUR BROWNE, witness said he had never heard of a case where an undertaking specially mentioned in the Act was valued upon structure instead of upon revenue. His practice was invariably to take 33¼ years' purchase as a basis for the value of a water undertaking, and afterwards to make additions or deductions in accordance with the circumstances of the case. The 33¼ was not the ultimate figure.

This concluded the case for the Company.

Mr. *W. B. Keen* was then called on behalf of the District Council. He presented the following valuation of the undertaking, based upon the figures supplied by Messrs. Lass, Wood, and Drew.

	1899	1900	1899.	1900.
Profit on water as per printed accounts			£59 18 11	£234 18 6
Deduct—				
Wages overcharged to capital		£32		
Repairs and renewals undercharged	£20	20		
Empties and bad debts, to make up charge to 10 per cent. on rental	46	95		
Proportion of costs of abortive Bill	100	100	166 0 0	247 0 0
			£106 0 0	£13 18 6

Net estimated loss

1899	£106
1900	14
	2)120
Average loss	£60
Deduct increased future revenue by adoption of true rateable value	£300
Less for probability that Pump-House Hotel will not take supply	78
	£222
	60
	£162

Capitalize at twenty years' purchase	£3240
Add for future development five years' purchase	810
	£4050
Add 5 per cent. for compulsory sale	200
	£4250

Sir *Alexander Binnie* was the next witness called. He estimated the total value of the undertaking at £7373, in which he had included the matters dealt with in the Act, the undeveloped state of the undertaking, and the probable growth of the district. He stated that he found that the works had not been maintained any better than the accounts had been kept. If the district did grow, it would be necessary, even if the River Ithon were still used, to expend a large amount of capital in re-laying mains and establishing proper works.

In cross-examination by Mr. BALFOUR BROWNE, witness admitted his valuation was not a structural one, but from capital expended. The figure was £7254, to which he added the probable value of the structural undertaking in 1884—the old works. He was not aware that the £7254 only represented expenditure between 1887 and 1898; but if that were so, what was spent between 1884 and 1887 would have to be added. The pumping-stations on the Ithon and the springs were sufficient for the present supply of the town, but not for a considerable time to come, if there were rapid growth. In his valuation, he had not made any allowance for several matters referred to in the Act.

Dr. *Francis Roberts*, formerly Medical Officer of Health in Llandrindod from 1891 to 1896, said that the supply of water from the River Ithon was a burning question then; and if it had continued, he thought that the development of the town as a watering place would have been interfered with. He had examined into the complaints of the water, and found they were in the majority of cases justified. He had reported year after year against the water supply.

Mr. *David Davies*, Clerk to the Urban District Council, said the water supply was altogether unsatisfactory, both with regard to quality and quantity.

This concluded the evidence.

Mr. WEDDERBURN, in summing up the case for the Council, contended that the use of the River Ithon was neither a right, power, or privilege, but was an invasion of the rights of the riparian owners, and therefore did not come within the definition of the word "undertaking" which the Council were to purchase. As to the position of the Company, year by year there had always been a deficit. At the end of 1900, they had never paid a penny on their ordinary shares; the preference shares had only their interest paid out of borrowed money; and their capital expenditure was £5700 in excess of what was authorized. Speaking generally, the Company were in debt to the amount of £6000, had never paid a penny of interest, and would have been bound, if they had got their Bill, to a further expenditure of £11,000. He could not conceive of a more rotten concern. Yet Mr. Deacon wished them to believe that the Company would suddenly change a deficit of £100 a year into a profit. If the debenture interest, the amount due on excess capital, and the law expenditure spread over a term of years, were deducted from Mr. Deacon's figure of £821 for maintainable revenue, it left a deficit; and, in addition, a further expenditure of £11,000 would have been necessary to continue working. According to Mr. Keen, £162 was the amount of net revenue.

Mr. BALFOUR BROWNE admitted that if there were to be an ordinary valuation of the undertaking on revenue, the Company would have next to nothing. That was the case which they had put before Parliament, who thereupon decreed that the undertaking was to be valued not upon the present, but upon the future, and that an allowance was to be made for compulsory purchase.

This concluded the proceedings. The decision of the Arbitrators will be given in due course.

TEES VALLEY WATER SUPPLY.

Further Borrowing Powers.

An inquiry was held last Wednesday by Mr. E. A. Sandford Fawcett and Mr. R. J. Reece, Inspectors of the Local Government Board, into an application by the Darlington Corporation for the issue of a Provisional Order to alter and amend the Darlington Extension and Improvement Act, so as to enable the Corporation to borrow further moneys for the purposes of the water undertaking. Mr. R. Luck stated the case for the Corporation. He said that the application was for leave to borrow £50,000; but it was now only contemplated to expend £22,000 for adding to the engine power. The pumping rights of the Corporation from the River Tees were by the Act limited only by the amount of water required by the consumers within the authorized district of the borough. The present engines were old and inadequate. They were working generally to their full capacity; and a breakdown would leave a large portion of the area without a supply. Mr. T. Smith, the Corporation Water Engineer, gave evidence as to the inadequacy of the engines, and said there was early prospect of a larger requirement for water. Mr. Watson, representing the Corporation of Thornaby, said that Corporation, as well as Stockton and Middlesbrough, had a large river frontage to the Tees. If the pumping machinery were increased as proposed, it would abstract a much larger quantity of water from the river, which might affect the interests of the towns named. Mr. Charles Hawksley testified that it was not safe to rely upon the existing machinery. Mr. Amos, for the Tees Conservancy Commissioners, said they wished a limit to be put—say, of half as much more as was now drawn—amounting to 15 million gallons in the whole. Mr. Watson, on behalf of the Corporations of Thornaby, Stockton, and Middlesbrough, thought a limit should be put to the pumping (say) of 17 million gallons. The Tees Valley Water Board had a limit; and he held that Darlington should have one also. Mr. Luck replied, and the inquiry closed.

WEST GLOUCESTERSHIRE WATER COMPANY'S BILL.

A Special Meeting of the Company was held on Tuesday last, to consider the Bill now pending in Parliament for extending the limits of supply, the raising of further capital, and for other purposes. The Chairman (Mr. E. Horton) said that at the time of the last half-yearly meeting of the Company, it was not in the minds of the Directors to promote a further Bill; otherwise some mention of the fact would have been made. Since then, however, events had marched rapidly; and an agreement had been entered into between the Company and the

Great Western Railway Company, which the Directors were satisfied would be of mutual advantage. The agreement was one whereby the guarantee between the two Companies, the one to pay for, and the other to supply, water to Old Sodbury, had been commuted by the payment of a lump sum down on the part of the Great Western Railway Company, in release of certain of their obligations; and in lieu thereof, the parish of Old Sodbury was to fall into line with the other portions of the Water Company's district. Forming part of this transaction, a verbal understanding had been entered into between the Company and the Duke of Beaufort that the Directors would do their best to promote an unopposed Bill during the current session, for the purpose of supplying the village of Badminton and two or three villages adjacent thereto, the water supply of which had been interfered with by the construction of the new direct line from London to South Wales. The sum of £40,000, out of a total capital of £60,000 authorized under the Act of 1899, having been expended, it was thought advisable to ask for authority to issue another £60,000, and also for power to acquire additional land by agreement in the event of it being required in the future—the quantity previously authorized having reached its limit. The provisions of the Bill having been explained, the resolution in favour of its promotion was carried unanimously.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Mr. W. B. M'Lusky, the Gas Engineer and Manager to the Perth Gas Corporation, has reported to them, with reference to the required extension of the productive plant at the gas-works, that several improvements have been effected in the construction and working of inclined retorts since the Committee last considered the subject; and that while personally he favoured the sloping retort—on the ground that stoking machinery was not required, and that the labour of charging and drawing was reduced to a minimum—yet the high initial cost of the settings, and the proportionately higher cost of renewals, debarred him from recommending the adoption of that system alongside the existing horizontal retort-settings and West's manual stoking machines. A complete installation of inclined retorts, capable of producing the maximum quantity of gas at present required, would cost a little over £9000; a horizontal bench of equal producing capacity, fully equipped with charging-machines, would cost about £6500. Apart from this, there was a further advantage in continuing the existing system, as it could be done oven by oven, by simply adding each year the number of retorts necessary to meet the increasing demand; and in any emergency, such as the failure of a setting, the workmen could be transferred to one of the reserve settings on the same system, without interruption of work. He recommends, therefore, that they should abide by the system of horizontal retorts, and that they do not go on with the erection of a complete installation just now, but that they proceed with the erection of the arches, which will be filled with retorts as required; and that meantime they should fill three arches each with eight through retorts, which, he believes, will be sufficient to produce gas equal to the demand of next winter. The cost he estimates at about £4500. He reports that the annual output of gas has increased since 1896-7 from 124 to 181 million cubic feet, and the maximum daily output from 663,000 to 943,000 cubic feet. The number of available retorts in 1896 was 110; and last year, 112. This clear report will be considered by the Gas Commissioners at their first meeting.

Since the extended gas-works of the Dundee Corporation have been brought into use, there have been continual complaints about the emission of smoke and dust from them. The matter has gone the length of complaint by the residents in the neighbourhood, who, in a sort of organized form, have written to Sir Thomas Thornton, the Town Clerk, on the subject. The petitioners have pointed out that the Town Council had authorized the prosecution of manufacturers and others who did not consume their own smoke; that the smoke, dirt, and dust emitted from the gas-works have been so thick that sometimes one could not discern an object more than three yards distant; and that their furniture and food have been permeated by it. The petitioners have been informed that the subject is receiving the special consideration of the Gas Manager and others, and that the most effective method of reducing the nuisance to a minimum is being studied. The petitioners have given it out that, if nothing is done to remedy the evil they complain of, they will call the attention of the Health Department of the Local Government Board to it. I cannot help thinking that the matter is exaggerated by the complainers.

At the last meeting of the Dunfermline Town Council, it was reported that a letter had been received from the Government Inspector of Alkali Works, calling attention to the arrangements for dealing with the noxious gases given off during the manufacture of sulphate of ammonia, and pointing out that the means for cooling and removing the vapour of water present in the gases leaving the saturator are not satisfactory, and much steam passes to the purifier. The quantity of gas and vapour thus reaching the purifier are unduly great, while the area of the purifier, even for properly cooled gases, is limited. The letter has been sent to the Works Sub-Committee for consideration and report.

The Falkirk Town Council on Monday discussed at very great length a proposal by the Gas Committee regarding the railway access to the proposed site for the new gas-works at Thornhill. As I stated last week, the North British Railway Company had submitted plans for a railway siding which were understood to do away with objections to previous schemes. The Gas Committee recommended the Council to agree to these on the condition that a satisfactory arrangement should be come to with the Railway Company. It was upon this that the discussion took place. There could be no doubt that the new plan was an improvement upon the former one; but there was a whisper of a suggestion that a better route for the railway connection could be had, alongside the canal, if the North British and Caledonian Railway Companies would agree. I suppose it is there that the difficulty lies, as the Railway Companies have arranged not to enter into competitive schemes for a fixed number of years; and so long as that agreement lasts, while neither will promote a scheme competitive with the other, neither will care to enter into a mutual scheme which might lead to the benefit as much of the other as of themselves. They are thus at a deadlock, each waiting for the expiry of the agreement, when they will be free to act as they please. That is the difficulty so far as the Railway Companies are concerned. There is the further difficulty that, if agreement is come to with the North British Company now, the Thornhill site will be fixed upon. This view was voiced in the Council, and although Provost Weir assured them that the minute committed them to nothing, it was really the question which divided the Council; and the Provost's assurance was a sort of a soft way of letting down the opponents of the Thornhill site. The Council, by nine votes to six, approved of the minute, which means that the Thornhill site is finally approved of—unless the North British Railway Company should turn out obstreperous, which they are not likely to do, as meantime they will have all the traffic into the new works.

The Gas Manager of the Greenock Corporation (Mr. W. Ewing) made a report at the last meeting of the Town Council dealing with the gas consumption and with the difficulties at Inchgreen. His monthly report, which was first submitted at a meeting on the 14th inst., set forth that for the month of December the quantity of gas made was 44,348,600 cubic feet, against 42,904,100 cubic feet in the corresponding month of the preceding year; showing an increase of 1,444,500 cubic feet. The average make of gas per ton of coal carbonized was 9844 cubic feet, while the quantity of gas sent out was 44,540,000 cubic feet, against 42,888,000 cubic feet in the corresponding month of the preceding year—being an increase of 1,652,000 cubic feet. During December, great difficulty was experienced in passing the maximum quantity of gas made through the purifiers, owing to their small area. The back-pressure reached 23 inches; and it was found necessary to bye-pass the meter for a time. Owing to these defects, there was occasionally considerable difficulty in keeping up the supply and quality. However, no serious hitch occurred, notwithstanding the narrow margin of safety and the many difficulties which had to be overcome. The minutes were adopted.

Mr. G. Keillor, jun., the Manager of the Peterhead Corporation Gas-Works, gave the inhabitants of the town a practical illustration of what can be done in the matter of illumination by gas, by means of Lucas intensifying lamps, which must have astonished some of the older residents whose memories carry them back to the days of lighting by means of whale oil, of which commodity Peterhead was for many years the principal market in this country. Mr. Keillor is an enterprising Gas Manager, who does not regard his duties as being confined to the production of gas. A firm of merchants in the town had under their consideration estimates for the lighting of their premises by electricity, when Mr. Keillor quickly brought to their notice the possibilities of lighting by a high-pressure gas system. The firm at once gave up the notion of using electricity, and they now light their place by gas compressed by means of Keith's plant, which is giving every satisfaction.

The other day an installation of electric lighting was inaugurated in Alloa. It has been fitted up by the British Electric Plant Company, who seem to have entered upon a manufacturing adventure in that town, because of its central position, and who, rather than the Corporation, appear to be the promoters. To give the movement a send-off, Bailie Maclay, the Convener of the Glasgow Corporation Electricity Committee, was brought forward; and at the banquet which followed the switching on of the current, he was put up to propose the toast of success to the scheme. He had reached the point of declaring his belief that the installation would be an undoubted success, when the light suddenly went out. That is an experience which has happened to Bailie Maclay before, according to his own statement; and we know that it is not an uncommon one. On this subject I will only add, as showing the broad view which is taken by the gas interest in lighting questions, that the toast was acknowledged by Bailie Arrol, of Alloa, who said that, as Convenor of the Gas Committee of the Corporation, he would do all in his power to foster the new light, and he trusted the ratepayers would do their part by using it largely.

Some important information has been obtained by the Edinburgh and District Water Trustees from reports by Mr. G. H. Hill, of Manchester, whom they consulted as to their Talla extension works. Mr. Hill brings out that in some of the tunnels the Contractors have been leaving the timbering in when concreting. He considers that, as a general rule, all timber should be taken out. It was explained by Mr. Tait, the Engineer to the Trust, that timbers were only left in where the material was wet sand. There would appear to have been a difficulty with the Contractors as to the removal of the timber; but the Trust have indicated their opinion that if the Engineer orders the timber out, the Contractor must obey. Mr. Hill also reported upon the construction of filter-beds for the new water supply. Upon this subject, his advice was that, considering the quality of the water, filtration might not be necessary; but the question could only be determined after the new supply was brought in. The Trust adopted this view; and by doing so they will save, in the meantime, an outlay of somewhat about £200,000.

The Gas Extension Contracting Company, Limited, has been registered to adopt an agreement for the acquisition of certain inventions relating to (1) a new atmospheric gas-burner, which can be used in various ways; (2) a new stove, in which the same is used; and (3) a new apparatus for consuming smoke from coal fires by the use of gas; and to acquire and turn to account any other patents. There will be no initial public issue.

The New York Department of Labour has collected figures giving the number of members of labour organizations in the principal countries of the world. According to these figures, there are 5,546,477 members of Trade Unions in the ten principal countries. Great Britain leads off with 1,905,116 members; the United States and Canada following with 1,600,000 members—these being the only two countries with more than a million members. There are 995,435 members of such associations in Germany, 538,832 in France, 157,773 in Austria, 96,359 in Denmark, 64,000 in Hungary, 58,340 in Sweden, 49,034 in Switzerland, and 31,558 in Spain.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 25.

Sulphate of Ammonia.

There has been a well-sustained demand at all points, and values have slightly improved; the closing quotations being £11 5s. per ton f.o.b. Hull, and £11 7s. 6d. per ton f.o.b. Liverpool and Leith. Consumers have come more into line with current prices; but the rather ample supplies have prevented any material advances. In the forward position, the London quotation remains £11 10s. per ton, Beckton terms; and Leith, ordinary terms, £11 10s. to £11 7s. 6d. per ton, according to position. For delivery over the summer and early autumn months, there has been speculative offering abroad at a discount on makers' prices.

Nitrate of Soda.

Nitrate of Soda is again firmer; and the spot quotations are 9s. 10½d. to 10s. per cwt., according to quality.

LONDON, *Jan.* 25.

Tar Products.

There is nothing special to advise as regards the market during the past week. The demand for pitch continues very strong, especially from London; but unfortunately the makers are unable to offer any for delivery before September. 90 per cent. benzol is easier; one or two of the large makers in the North appearing anxious to sell. In all probability, 10d. would be accepted for February-June, although the London makers are still asking 10½d. for prompt, and 11d. for forward delivery. 50-90 per cent. is also easier. Some quantity was offered at 9d. for January-February, but was declined by the consumer. Creosote continues firm; another large railway contract having been let during the past week at fairly good prices. The Midland makers are rather stronger in their ideas; and there is more inquiry in the North, although in the Lancashire district prices appear to be a little easier. Crude carbolic is generally quiet. Some quantity of 60's has been placed at 1s. 10d. for export, at outports, while business is reported in 50's at 1s. 7d. on railways, prompt. As regards crystals, 39-40's are certainly easier, the demand being very small; while the orders for 34-35's appear to be monopolized by the German manufacturers. There is nothing fresh to advise as regards tar; no contracts of any importance having been offered during the week.

The average values obtaining during the week are: Tar, 15s. 6d. to 18s. 6d. Pitch, east coast, 36s. to 36s. 6d.; London, 38s. to 38s. 6d.; west coast, 34s. to 34s. 6d. Benzol, 90's, 10d.; 50's, 9d. Toluol, 9d. to 10d. Crude naphtha, 4d. Solvent naphtha, 11d. Heavy naphtha, 10d. Creosote, North, 1¼d.; London, 1¾d. to 1⅞d. Heavy oils, 2⅛d. to 2⅜d. Carbolic acid, 60's, 1s. 10d. Naphthalene, 55s. to 72s. 6d.; salts, 25s. to 40s. Anthracene, "A," 2d. to 2¾d.; "B," 1d. to 1¼d.

Sulphate of Ammonia.

The market continues firm; but there is not quite such a strong demand for prompt delivery. Beckton has again made several sales at £11 10s. for January shipment; and another large London Company is reported to have sold at the same price. Business has been done in Hull at £11 6s. 3d. for best makes, early shipment, while £11 7s. 6d. is asked for February-March. The position in Leith remains unchanged. There appears to be a good demand at £11 6s. 3d. for prompt, and £11 7s. 6d. for February-March. As regards Liverpool, business is limited; but prices do not seem to have changed during the week.

COAL TRADE REPORTS.

Lancashire Coal Trade.

At present business is moving on steadily, with no quoted change in prices. Supplies, however, are more plentiful in all descriptions of fuel; and the probability of some early giving way in prices is a matter of general anticipation among both buyers and consumers. The position, taking it all through, is reported as one in which prices are being fairly well maintained, but not with the firmness that has been noticeable recently. In fact, the improvement that came over trade pretty generally towards the close of last year seems now to be disappearing; and the slight advances that were then obtained are being gradually lost—the market for the most part having got back to something like the level at which it stood about November last. For house-fire qualities, the demand is only moderate; but collieries are still moving away what they are raising, and at the pit prices are steady at about 15s. to 15s. 6d. per ton for best Wigan Arley, 13s. to 13s. 6d. for Pemberton four-feet and seconds Arley, and 11s. to 11s. 6d. for common house coal. Common round coals are also in limited inland request for steam and forge purposes; and it is exceptional where more than about 9s. per ton is being secured. For shipment, however, there is still a fairly good demand; with the better qualities of steam coal fetching from 10s. 9d. to 11s. 3d. per ton, delivered at the ports on the Mersey. Slack is again becoming more plentiful; and the commoner sorts are being pushed from outside districts at very low figures. Here and there, at Lancashire collieries, considerable quantities have recently been accumulating under load in waggons; and prices, if anything, have been easier. It is only for special sorts of slack that more than 7s. per ton at the pit is being secured, which may be taken as the full average figure for best descriptions of engine fuel. Common Lancashire slack ranges from 5s. 6d. to 6s. per ton. Coke is in fairly steady demand, with no quoted change in local rates, which remain at 22s. to 24s. per ton for best Lancashire foundry qualities, and 13s. to 14s. for best washed furnace cokes, at the ovens.

Northern Coal Trade.

The coal trade of this district is still inactive; but the dulness is most shown in the steam coal branch of the industry, though it is in some degree marked in most sections. Best Northumbrian steam coals are weak at from 10s. 9d. to 11s. 3d. per ton f.o.b.; for though the collieries have so far work to keep them employed, there is little comparatively sold over the season. Steam smalls are lower at 5s. to 5s. 3d.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 203.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	18—19	..	5 10 6
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	9⅞—10⅛	..	4 19 0
200,000	5	Nov. 13	6⅜	Bombay, Ltd.	6¼—6⅜	..	4 16 4
40,000	5	,,	6¼	Do. New, £4 paid	4¼—4⅜	..	5 9 5
380,000	Stk.	Aug. 15	12	Brentford Consolidated	265—270	..	4 8 11
270,000	,,	,,	9	Do. New	192—197	..	4 11 5
50,000	,,	,,	5	Do. 5 p.c. Pref.	130—135	..	3 14 1
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	112—115	..	3 9 7
220,000	Stk.	Sept. 12	10	Brighton & Hove Orig.	210—215	−3	4 13 0
246,320	,,	,,	7	Do. A. Ord. Stk.	150—155	..	4 10 4
420,000	20	Sept. 27	10	British	41—42	..	4 15 3
50,000	10	Aug. 15	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
82,850	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	Oct. 11	6	Buenos Ayres (New) Ltd.	9½—10	..	6 0 0
220,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
150,000	20	July 17	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
550,000	Stk.	Oct. 11	12	Commercial Old Stock	265—270	..	4 8 11
236,425	,,	,,	9	Do. New do.	203—208	..	4 6 7
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	,,	9	Continental Union, Ltd.	162—167	..	5 7 9
200,000	,,	,,	7	Do. 7 p.c. Pref.	160—165	..	4 4 10
575,000	Stk.	Aug. 29	5	Crystal Palace Ord. 5 p.c.	122—127	..	3 18 9
60,000	,,	,,	5	Do. 5 p.c. Pref.	123—128	..	3 18 2
486,090	10	July 17	10½	European, Ltd.	19—20	..	5 5 0
354,060	10	,,	10⅜	Do. £7 10s. paid	14—15	..	5 5 0
15,079,885	Stk.	Aug. 15	4 1/16	Gas-light and Coke — 4 p.c. Ord.	96—98	−2	4 9 8
2,600,000	,,	,,	3⅛	Gas-light and Coke — 3⅛ p.c. max.	89—91	+1	3 16 11
2,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	111—114	..	3 10 2
4,063,425	,,	Dec. 13	3	Gas-light and Coke — 3 p.c. Con. Deb.	91—93	..	3 4 6
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	Nov. 13	10	Imperial Continental	210—214	..	4 13 6
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Aug. 29	10	Liverpool United A	232—234	..	4 5 6
718,100	,,	,,	7	Do. do. B	171—173	..	4 0 11
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	117—118	..	3 7 10
75,000	5	Dec. 13	4	Malta & Medn., Ltd.	4⅛—5	..	4 0 0
560,000	100	Oct. 1	5	Met. of — 5 p.c. Deb.	106—110	..	4 10 11
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	Nov. 13	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Aug. 9	4⅜	Newc'tle & G'tesh'd Con.	106—107	..	4 1 9
312,855	Stk.	Dec. 27	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
150,000	5	Nov. 28	8	Oriental, Ltd.	7⅛—8	..	5 0 0
135,000	4⅛	,,	8	Do.	6⅞—7⅛	..	4 19 4
15,000	1	,,	8	Do.	1¼—1⅜	..	4 11 5
60,000	5	Sept. 27	7	Ottoman, Ltd.	5⅞—6⅛	..	5 12 0
					* Ex. div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
851,070	10	Oct. 11	7	River Plate Ord.	10—10⅛	..	6 13 4
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	94—97	..	4 2 6
250,000	10	Sept. 27	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Sept. 12	10	Sheffield A	242—244	..	4 2 0
209,984	,,	,,	10	Do. B	242—244	..	4 2 0
523,498	,,	,,	10	Do. C	242—244	..	4 2 0
5,761,885	Stk.	Aug. 15	5	South Met., 4 p.c. Ord.	127—129	+2	3 17 6
1,627,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	91—93*	..	3 4 6
380,940	Stk.	Nov. 13	5	Southampton Ord.	102—106	..	4 14 4
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	102—107*	..	3 14 9
120,000	Stk.	Aug. 29	5½	Tottenham and Edmonton — A. 5 p.c.	122—127	..	4 6 8
250,520	,,	,,	4	Tottenham and Edmonton — B. 3½ p.c.	95—100	..	4 0 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	7—8*	..	6 5 0
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	95—98	..	5 2 0
230,000	5	Aug. 15	9	West Ham, 10 p.c.	9½—10½	..	4 5 9
172,000	10	,,	6	Do. 7 p.c.	12½—13½	..	4 8 11
140,900	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,599	Stk.	Dec. 30	11⅛	Chelsea, Ord.	315—320	..	3 11 11
150,000	,,	,,	5	Do. 5 p.c. Pref.	152—157	+2	3 3 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	+2	3 2 1
175,785	,,	Sept. 27	4½	Do. 4½ p.c. Deb.	142—147	+2	3 1 3
1,720,560	Stk.	Oct. 11	7	East London, Ord.	195—200	−2	3 10 0
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	142—147	+2	3 1 3
1,018,046	,,	,,	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50	Dec. 13	8	Grand Junction — 10 p.c. max.	114—117	+1	3 8 5
310,000	Stk.	Sept. 27	4	Grand Junction — 4 p.c. Deb.	127—132	+5½	3 0 7
708,000	Stk.	Aug. 15	14	Kent	300—305	..	4 11 10
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—205	..	3 8 4
1,043,800	100	Dec. 30	10½	Lambeth, 10 p.c. max.	293—298	..	3 10 6
406,200	100	,,	8	Do. 7½ p.c. max.	217—222	..	3 12 1
350,000	Stk.	Sept. 27	4	Do. 4 p.c. Deb.	127—132	..	3 1 7
500,000	100	Aug. 15	12 8/10	New River, New Shares	395—405	..	3 3 2
1,000,000	Stk.	July 31	4	Do. 4 p.c. Deb.	127—132	+2	3 0 7
902,300	Stk.	Dec. 13	7	South-wark and Vauxhall — Ord.	193—198	..	3 10 8
126,500	100	,,	7	South-wark and Vauxhall — 7½ p.c. max.	183—188	..	3 14 6
489,200	Stk.	,,	5	South-wark and Vauxhall — 5 p.c. Pref.	153—158	+3	3 3 3
1,019,585	,,	Oct. 11	4	South-wark and Vauxhall — 4 p.c. A Deb.	125—130	+1	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex	280—290	..	3 9 0
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	+3	3 2 1
200,000	,,	Sept 12	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
					* Ex. div.		

In gas coal, there is more negotiation for forward contracts, especially for export during the shipping season; and the prices quoted are from 9s. 6d. to 10s. per ton, according to class, &c. The demand is still fairly full for gas coals on old contracts, and the collieries are well employed; but there is less pressure than there was, and the consumption is beginning to diminish. Coke is generally quieter. Best Durham coke for export is about 17s. 6d. per ton f.o.b.; and blast-furnace coke is about 16s. 6d. free at the Teesside furnaces. Gas coke has naturally felt the dulness, the more so because this is the season of full production. Prices for gas coke vary; but 10s. per ton f.o.b. has been quoted.

Scotch Coal Trade.

There is a feeling of somewhat greater firmness in the trade, which is shown more by the willingness to give forward orders than by any actual rise in prices. The tax question may be said to be a known quantity now; and following that step, a settling down process may be expected, in which prices will right themselves, and trade will be free to expand. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 3d. to 11s. 3d., and splint 11s. 3d. to 11s. 6d. The shipments for the week amounted to 185,715 tons—an increase of 58,415 tons upon the preceding week, but a decrease of 9996 tons upon the corresponding week of last year. For the year to date, the total shipments have been 405,306 tons—a decrease of 5659 tons upon the corresponding period of last year.

The Reward of Perseverance.—An instance of the reward of industry comes under notice in connection with the firm of Messrs. George Glover and Co., Limited. Recently, they advertised in our columns for a Manager for their Leeds branch. One of the aspirants for the position was Mr. Charles Flood, one of their own men, whose good work and perseverance had earned for him the marked confidence of his employers. At the bench, he has been earning above £4 a week. In addition to the experience he gained with Messrs. Glover in London during the last fifteen years, Mr. Flood also spent three years for the firm in Australia, teaching men the trade there. As in his ordinary work, so as a teacher, he gave the firm the greatest satisfaction. His practical experience and proved ability will aid him greatly in making his commercial life a success.

Water Supply in Mid-Kent.—Colonel W. R. Slacke, on behalf of the Local Government Board, has just concluded an inquiry into the Hollingbourne Rural District Council's scheme of water supply for a string of villages in Mid Kent, lying between Maidstone and Ashford. There was very strong opposition from landowners, brewers, farmers, the South-Eastern and Chatham Railway Company, and others; the opponents generally favouring the rival scheme of the Mid-Kent Water Company, who claim to be able to supply the district more cheaply than the Council, and to do so, moreover, without any liability on the district rate. The result of the inquiry is awaited with interest, as involving the question whether the scheme of a local authority, seeking to supply an admitted want under the Public Health Act, should be given official preference over that of a private company.

Attempted Sale of a Gas-Works by Auction.—On Monday of last week, Mr. James Jardine offered for sale by auction the whole of the plant, street-lamps, &c., belonging to the Ecclefechan Gas Company. The property was first put up at £450, and then at £400; but even at the latter figure there were no bidders, and the sale was consequently adjourned.

Shipley and the Price of Gas at Baildon.—Mr. J. Bentley succeeded in getting the Baildon District Council to pass a resolution last Tuesday to the effect that the Shipley District Council be memorialized in regard to a reduction in the price of gas to Baildon consumers. The Shipley Council have not long been in possession of the supply; but Mr. Bentley's argument in support of his resolution had no reference to ownership. Put generally, he stated that the price of gas was formerly 2s. 6d. per 1000 cubic feet; but in consequence of coal strikes, the charge was raised to 2s. 9d., and then to 3s. 1d. He gave figures to show that coal was no dearer to-day than it was in 1893. At Widnes, gas was supplied at 1s. 5d. In Bradford, it was 2s. 6d., with a varying discount of from 2½ to 12½ per cent. He assumed that Bradford gas did not cost more than 1s. 9d. to make. The seconder of the motion made the suggestion that it might be possible for Shipley to supply the Baildon Council with gas in bulk through a large meter at Baildon Bridge. The Chairman mentioned that the Council had power under the Shipley Act to take over the mains in the Baildon district, and get gas in any other way they liked. He did not, however, suppose that anyone thought of doing this at present; but perhaps the Shipley Council would see their way to meet them to some extent. As already mentioned, the resolution was carried.

Messrs. Bryan Donkin and Clench, Limited, have just received an order from the Glasgow Corporation for the following rack-and-pinion gas-valves: 19 30-inch, 58 24-inch, 17 20-inch, and 52 18-inch; representing a total weight of about 100 tons.

The Special Committee appointed by the Manchester City Council to inquire into, and report upon, the present method of allocating the profits of the gas undertaking (*ante*, p. 100), have chosen Alderman Gibson as their Chairman. The Committee will meet at an early date to arrange the order of procedure in the inquiry.

When presiding recently at the annual meeting of the Exeter and District Chamber of Commerce, in the absence of the President (Sir Edgar Vincent, M.P.), Mr. H. A. Willey, who is the Chairman of the Chamber, remarked that the question of municipal trading was one which had been ventilated at the meetings of the Associated Chambers of Commerce. In Exeter they had a Progressive party in power, and, personally, he sincerely wished them every possible success in conducting municipal affairs. He was sure they would see that such undertakings of public necessity as water and gas formed a legitimate sphere for their activity. At the same time, he hoped and believed they would recognize the true economic law which suggested that all business ventures should be left to business men.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	WINNIPEG, MAN.	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	COLCHESTER (Second Contract)	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	YORK	750,000
COLCHESTER	300,000	ROCHESTER	500,000
BIRKENHEAD.	2,250,000	KINGSTON, ONT.	300,000
SWINDON (New Swindon Gas Co.)	120,000	CRYSTAL PALACE DISTRICT	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	DULUTH, MINN.	300,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	CATERHAM	150,000
HALIFAX	1,000,000	LEICESTER	2,000,000
TORONTO	250,000	ENSCHEDE (HOLLAND)	150,000
OTTAWA.	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000
LINDSAY (Remodelled)	125,000	BURNLEY	1,500,000
MONTREAL	500,000	KINGSTON-ON-THAMES	1,750,000
TORONTO (Second Contract; Remodelled)	2,000,000	ACCRINGTON	500,000
BELLEVILLE	250 000	TONBRIDGE	300,000
OTTAWA (Second Contract)	250,000	STRETFORD	500,000
BRANTFORD (Remodelled)	200,000	OLDBURY	300,000
ST. CATHERINES (Remodelled)	250,000	TODMORDEN	500,000
KINGSTON, PA.	125,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
PETERBOROUGH, ONT.	250,000	YORK (Second Contract)	750,000
WILKESBARRE, PA.	750,000	ROCHESTER (Second Contract)	500,000
ST. CATHERINES (Second Contract)	250.000	NEWPORT (MON.)	250,000
BUFFALO, N.Y.	2,000,000	TOKIO, JAPAN.	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS . . . 1,800,000 Cubic Feet. SMETHWICK. . . . 500,000 Cubic Feet.

MALTON, 150,000 Cub. Ft. . GRAVESEND, 300,000 Cub. Ft. . PERNAMBUCO (Brazil), 125,000 Cub. Ft.

Cheap Gas at Winnington.—Messrs. Brunner, Mond, and Co., Limited, who make and supply the gas used by the colony of workers in the township of Winnington, have broken the record for cheap gas. Their consumers are now charged 1s. per 1000 cubic feet. Hitherto the price has been 2s.

Cleveland Water Company.—The half-yearly report of the Cleveland Water Company has been issued. It shows that, after providing for all expenditure, there remains a balance of £5318. The Directors recommend that the full dividends be paid at the rate of 10 per cent. per annum on the original and "A" shares, and 7 per cent. per annum on the "B" shares. A balance of £1793 is to be carried to the credit of the next account.

The Wrong Use of Terms.—In negotiating contracts, the most scrupulous care should be exercised in connection with the terms employed. Some short time since, the Local Government Board, on the application of the Doncaster Rural Council, sanctioned a loan of £5000 for a water supply to Conisbro'. The case laid before the Board's Inspector was to the effect that the Denaby and Cadeby Colliery Company would "deliver" into the reservoir to be constructed by the Council water at a cost of 6d. per 1000 gallons. But the Company afterwards repudiated the condition, and asserted that they had never intended to convey the water from their mains to the reservoir. And moreover, as the Council now recognize, the Company have no right to lay pipes to the reservoir. The Council are satisfied a mistake has been made, and have applied to the Local Government Board for an additional £600 for laying the necessary pipes. They also suggest that a further inqury is desirable.

Keith's High-Pressure Gas Lighting.—At their Leeds offices and show-rooms, the James Keith and Blackman Company, Limited, have recently installed Keith's high-pressure system of gas lighting. On the inside of the window, a three-cluster light is fixed, while suspended outside is a four-light cluster—the aggregate illuminating power being 2330 candles. The effect on Gascoigne Street is most remarkable. In the window is a card, which attracts a great deal of attention. It reads as follows:—

A COMPARISON.

With Gas at 2s. 6d. per 1000 feet.

KEITH-BLACKMAN SYSTEM of HIGH-PRESSURE LIGHTING gives 1000-Candle Power for ONE PENNY PER HOUR.	ORDINARY GAS LIGHTING gives 1000-Candle Power for SIXPENCE PER HOUR.

With such an illustration and concise figures to guide them, the people of Leeds should not be long in adopting high-pressure gas lighting.

Proposed Water-Works Purchase at Worksop.—The Worksop Urban District Council have decided to give notice to the Water Company of their intention to purchase the undertaking.

Gas-Works Project for Bingley.—The Gas Committee of the Bingley District Council are experiencing a little difficulty in getting their proposal passed that new gas-works should be erected at Dowley Gap, and that for the purpose application should be made to the Local Government Board for powers to borrow £60,000 to carry out the scheme. The question was further discussed yesterday week, when it was considered prudent to refer the matter back to the Committee, in order that definite information may be obtained as to the financial position of the undertaking, and whether new works are justified by the increase in the gas consumption.

Leeds Gas Workers' Dispute.—We concluded our last reference to this matter (*ante*, p. 100) by stating that a ballot of the whole of the men was to be taken, to see if they would accept the Gas Committee's proposals subject to a minimum of six shifts per week. This has since been done; the question asked being: "Are you in favour of accepting the Gas Committee's offer, providing they guarantee six shifts per week?" There were 481 replies in the affirmative, 47 in the negative, and two spoilt papers were received. This result was placed before the Gas Committee, who have decided to allow the men a minimum of six shifts a week as far as possible.

Quick Main-Laying at Aldershot.—The Aldershot Gas and Water Company on the 1st ult. started laying an 8-inch main 6000 yards long. Of this, 1100 yards of old 3-inch main had to be replaced (thus increasing the labour, and necessitating the maintenance of the gas supply), and forty services connected over that distance. In spite of all the bad weather and frost, it is expected that the job will be completed this week. The main has had to be carried under a number of culverts; under a railway bridge which was being demolished and rebuilt, necessitating 100 yards being laid in concrete; and over another railway bridge, which required special arrangements to be made for the bedding of the main on the side in concrete.

Southport and Birkdale Gas Returns.—Southport and Birkdale are every year using less gas for lighting and more for cooking and heating. In the twelve months ending March, 1897, the quantities of gas sold respectively for lighting, cooking, &c., in Birkdale and Southport were as follows: Lighting, 286 million cubic feet; and cooking and heating, 36 millions. These figures showed an increase over the previous year of 16 million cubic feet for cooking and heating, and 5 million feet for lighting. In the twelve months ending March, 1901, the quantities sold in Southport and Birkdale were: For lighting, 260 million cubic feet; and for cooking, &c., 107 million feet—a decrease of 26 million cubic feet on the one hand, and an increase of 71 million feet on the other. During the period covered by the last annual report of the Gas Manager (Mr. John Booth), the process was emphasized. There was a total decrease of 8 million cubic feet in the sale of gas for lighting in the whole area of supply, and an increase of 16 million cubic feet in that for cooking and heating.

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DONNINGTON, Near NEWPORT, SHROPSHIRE.

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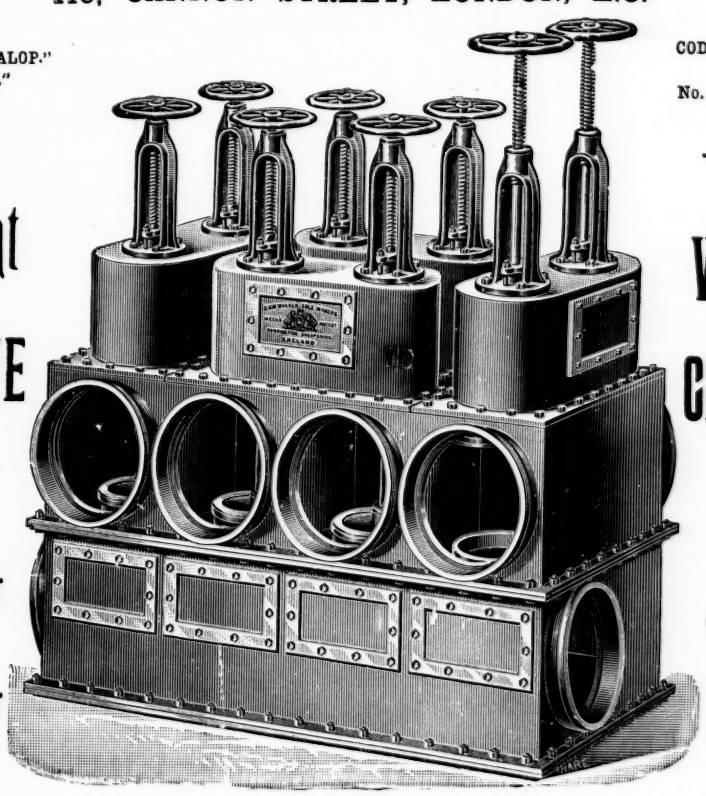
Weck's Patent CENTRE-VALVE



Weck's Patent CENTRE-VALVE

PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD.

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

New Offices for the Kingston Gas Company.—The new offices which have been erected for the Kingston Gas Company have lately been occupied by the staff. The building is of ornamental design, and is constructed of red brick, with terra-cotta dressings. On the ground floor there is a public office, and three rooms for the Secretary (Mr. J. A. Fricker), collectors, and ledger clerks, together with the strong-room, lavatories, &c. The first floor contains two large apartments, one of which will be used for the meetings of the Directors, and the other as a show-room; while the office of the Engineer and Manager (Mr. H. F. Packham) adjoins. Over these are three other rooms which are at present unoccupied, but are likely to be soon requisitioned for use.

The Quality of Aldershot Gas.—Everybody admits that accidents will happen in the best regulated families; and gas-works plant is not exempt from an occasional mishap. This occurred recently at Aldershot; and the result was that gas only partially purified was sent into the town. Formal complaint was made to the Company by the Urban District Council; and an explanation, accompanied by expressions of regret, was read at the last meeting of that body. The matter is in the hands of the Company's Consulting Engineers, Messrs. Corbet Woodall and Son, who will report fully upon it. A good deal is being made of the accident, to which the former Manager (Mr. J. Meiklejohn) was one of the first to direct attention. His conduct in so doing has been criticized; but he has disclaimed any hostility to the Company, and this appears to have been acknowledged by their Secretary (Mr. R. W. Edwards). Of course, the consumers suffered some inconvenience from the accident; but there is no reason for magnifying the trouble. The letter to the Council should furnish sufficient evidence of the Company's regret at the accident, and their determination to prevent a similar mishap in future

Guernsey Water Supply.—In reproducing the remarks on this subject which appeared in our issue of the 14th inst. (p. 83), the "Guernsey Evening Press" says: "Complaints again reach us with respect to the inadequate water supply of our Island—pumps running dry, and the lack of sufficient water generally, both for household and other purposes. The matter is a serious one for residents; hence we trust that some steps will soon be taken to allay the general inconvenience, and put an end to the many complaints from all quarters. It is always interesting to have outside opinion. Still, we need only add that, whether a remedy for the present unsatisfactory condition of things comes at the hands of the States or of the Water-Works Company, a long-suffering public will have full cause for gratitude. But let it be soon." We learn that it is really true that the pumps are running dry, and that there is still an inadequate supply by the Company; but in all parts of the Island it is apparent that the springs are later than has ever been the case in turning. The Company, in their anxiety to be well prepared for the coming season, are now driving a heading to connect their No. 5 well with a small well recently sunk as an experiment. It is confidently expected that there will be good results from this.

Water Divining at Harrogate.—At the instance of the Harrogate Corporation, Mr. J. Mullins last Thursday visited the town, for the purpose of locating springs in several fields adjoining the Valley Gardens. The Mayor (Alderman Simpson) and several Aldermen and Councillors attended. The diviner announced the existence of many springs; but whether they are fresh water or medicinal springs, it is impossible to say.

Sales of Stock and Shares.—Last Tuesday, Mr. C. A. Joel offered for sale by auction (in accordance with the terms of the advertisement which appeared in our columns) £50,000 of 5 per cent. preference stock (1894) of the Newcastle and Gateshead Water Company. The prices realized ranged from £145 to £147 per £100 of stock. On Friday, Messrs. Bruton, Knowles and Co. sold £1877 of consolidated ordinary stock of the Stroud Gaslight and Coke Company, at from £100 10s. to £103 5s. per £100 of stock.

Opening of Roads in London.—At the meeting of the London County Council last Tuesday, a motion on the above subject, which had been on the paper since the 1st of October, was adopted. It was proposed by Mr. Foster, who represents St. Georges-in-the-East, and was in the following terms: "That, in consequence of the growing evil, resulting in loss of life and injuries to persons, damage to business, and danger and delay to vehicular traffic, caused by the frequent and continuous opening of roads, it be referred to the Highways Committee to consider and report as to the best means for the Council to procure such statutory powers as to secure that all persons or companies having parliamentary powers to open the roads shall be compelled to give adequate notice to the Council before exercising such powers; and that the Council shall have the power to make such regulations and have such supervision as will ensure such work being done expeditiously, and with full regard to the public safety and business interests."

Hindley Gas Supply.—Last Tuesday, Mr. E. P. Burd, one of the Inspectors of the Local Government Board, held at inquiry at Hindley, upon an application by the District Council for a Provisional Order to partially repeal, alter, or amend the Hindley Local Board Acts, 1872 and 1875, which relate to the gas undertaking. Power is sought to borrow a further sum of £25,000 in respect of the gas-works, to provide for a new retort-bench, sulphate of ammonia plant, and gas mains, services, meters, taps, cookers, grillers, &c. Further authority is asked for respecting the supply of gas apparatus, &c., for lighting, heating, or other purposes; and it is intended to have broader powers as to the application of the revenue of the gas-works, the principal object of which is to be able to carry to the credit of the district fund so much of the balance remaining in any year as may, in the opinion of the Council, not be required for the purposes of the undertaking. Minor details relate to the repayment of the present outstanding loans of £40,900 in a uniform period—25 years being asked; and it is also desired to modernize the powers conferred by the Local Acts in conformity with present-day requirements. The result of the application is awaited with much interest in the locality.

WELSBACH

SELF-INTENSIFYING KERN BURNER

Giving a Lighting Efficiency of 300 CANDLES PER BURNER with about 10 Cubic Feet of Gas

AT ORDINARY PRESSURE.

Dispensing entirely with Auxiliary Compressing Plant of any kind whatever.

Specially Suitable for Lighting Large Areas.

The most Economical and Efficient System on the Market.

The Welsbach Shadowless Lantern, with Self-Intensifying Welsbach-Kern Burner.

FOR FURTHER PARTICULARS APPLY TO THE

WELSBACH INCANDESCENT GAS-LIGHT CO., Limited,

PUBLIC LIGHTING DEPARTMENT, YORK STREET, WESTMINSTER, LONDON, S.W.

The £5 preference and £1 ordinary shares of the Richmond Gas Stove and Meter Company, Limited, have recently been admitted to quotation in the London Stock Exchange Daily Official List; the prices being respectively $5\frac{3}{4}$ to $5\frac{5}{8}$ and $1\frac{7}{8}$ to 2.

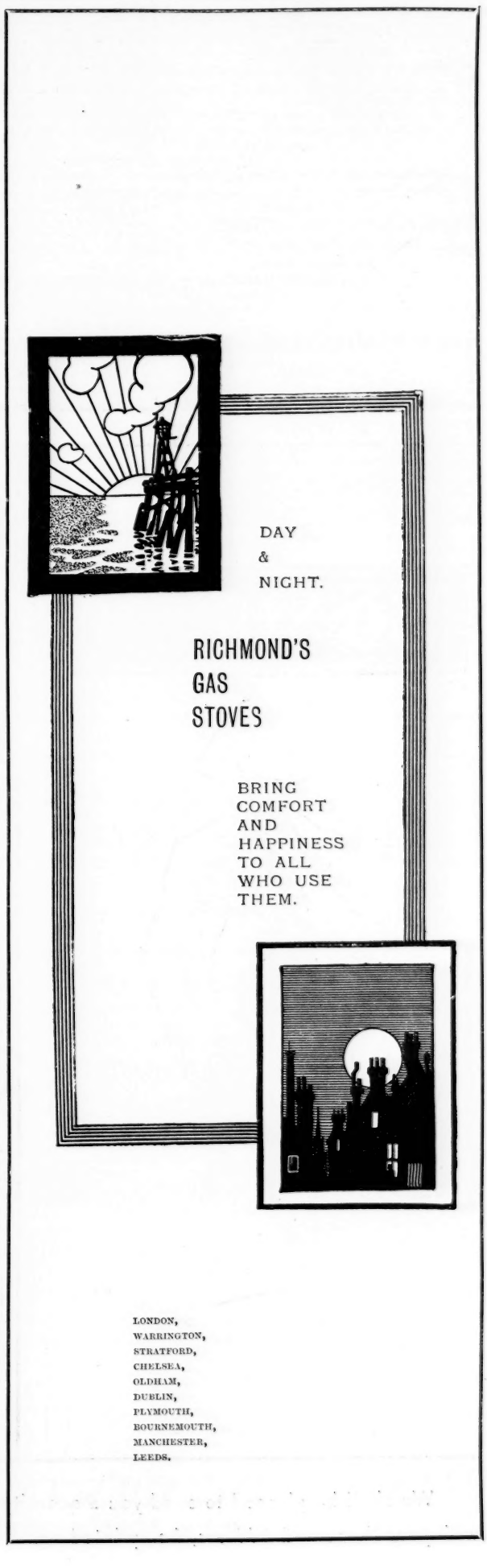
Messrs. J. Defries and Sons, Limited, who carried out the public decorations and illuminations at the Coronation and on other occasions during the reign of the late Queen, have been appointed decorative illuminators to the King.

It will be seen by an announcement which appears elsewhere that the Wetherby District Water Company are inviting applications at par for 11,233 shares of £5 each; being the balance of the capital authorized under section 10 of the Wetherby District Water Act, 1899, as extended by section 18 of the Act of the following year. The additional capital is required for taking the Company's mains to the Tadcaster district, and the construction of new works for the supply of water to the North-Eastern Railway Company at their South Milford and Church Fenton Stations, and also to the Micklefield Coal and Lime Company. These agreements alone are estimated to produce a revenue of £2800 per annum. The shares rank for dividend up to 10 per cent. The list opened yesterday for the subscription of the capital, and will close next Friday.

The Works Sub-Committee of the Glasgow Gas Commissioners recently had submitted to them by their Engineer (Mr. W. Foulis) tenders which had been received for (1) providing and erecting the iron and steel required in the construction of the retort-house flooring of the first portion of the new Provan Gas-Works; and (2) for providing rack-and-pinion valves in connection with the mains to be laid for these works. For No. 1, the offer of Messrs. Redpath, Brown, and Co., Limited, for £4970 (the lowest tender), was accepted; and for No 2, that of Messrs. Bryan Donkin and Clench, Limited, for £1605. Tenders were recently received for supplying cast iron pipe connections, tar-pipes, and wells required for the above-named works; and it was agreed to accept that of Messrs. John Shaw and Co., it being the lowest. The amount of the contract was £10 10s. per ton. The offer by Messrs. Babcock and Wilcox, Limited, for providing and fitting up two water tube boilers required for the addition which is being made to the chemical works at Dawsholm has been accepted; the amount of the contract being £685.

Owing to the death of Mr. George E. Orme, on the 21st ult., as noticed in our columns at the time, the "party and social," of the employees of the firm of Messrs. George Orme and Co., of the Atlas Meter-Works, Oldham, was postponed. It took place, however, on the 18th inst., at the Alexandra Hall in the town, when a gathering of upwards of 150 was presided over by Mr. F. H. Orme, at whose invitation they had assembled. A good programme of music, including some recitations, was gone through, and greatly enjoyed. A pleasing incident of the proceedings was the presentation of an illuminated address, together with a tea and coffee service, to Mr. J. R. Lee, who has been in the firm's employ for upwards of eighteen years, and is now engaged as representative. The presents were subscribed for by the officials, managers, foremen, and workpeople, and were handed to Mr. Lee by Mr. Daniel Orme, who referred to the cordiality of his relations with the recipient, and, in the course of a short address, offered some kindly advice to the young people in the company. The toasts of "Our Host, Mr. F. H. Orme," and "The Firm," were very heartily received.

There has been a reorganization of the official staff of the Richmond Gas Stove and Meter Company, Limited; and, in connection therewith, we find that two gas engineers are seceding from the professional ranks in order to devote their energies to the commercial side of the gas industry. Their intimate experience of the requirements of gas consumers will no doubt considerably aid them in making a success of their new callings; and we wish them good fortune. The principal change in the Company's staff is the elevation of Mr. J. W. Slack, who has been their successful representative in the South-Eastern district. He has now been appointed Secretary of the Company. It is interesting to note that Mr. Slack was formerly with the Tunbridge Wells and the Ashton-under-Lyne Gas Companies, and commenced his career with the Richmond Company seven years ago. He will also assume the secretaryship of the affiliated Companies, George Glover and Co., Limited, and George Newton, Limited. Mr. J. Fred. Wicks, who has been known in the gas world as the Engineer of the High Wycombe Gas Company, and is, we believe, the pioneer of letting out gas-engines on hire, has been appointed to succeed Mr. Slack. Mr. Sidney P. Thornton, who has managed the Company's Plymouth depôt since its opening, has been promoted to the Company's Wet-Meter Department, and will hereafter undertake the representation of George Newton, Limited. Mr. James P. Pratt, who has had charge of the automatic installation department in Dublin, has been promoted to the management of the Plymouth branch, and representative of the Company in the West of England. Then from the engineership of the Queenstown Gas Company, Mr. W. M. Donaldson goes to succeed Mr. Pratt as Superintendent of the automatic installation department in Dublin. In conjunction with these changes, it may be mentioned that from the date of the annual general meeting of the Richmond Company in March next, the registered offices will be transferred to No. 132, Queen Victoria Street, E.C. With the information of the foregoing changes, we received a copy of the Company's "Record," which is prepared for private circulation among the staff. This is a special issue, containing as it does a review of the past year's operations from the pen of the Chairman and Managing-Director (Mr. E. W. T. Richmond). The extension of the Company's scope in the industrial world by conjoining to the old business certain well-established gas-meter concerns take a prominent place in the retrospect. It will be of some interest to the gas profession to learn that sales during the year—in spite of the reduction caused by the $7\frac{1}{2}$ per cent. advance having been discontinued since April—show a satisfactory increase. Profit-sharing continues to prove its benefits by keeping the Company's men together, and assisting them to help themselves in preparing for "a rainy day." The fact that many are saving, and wish to do so to a greater extent, is proved by the application made for over £5500 worth of the employees' ordinary shares.



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"VOLCANIC" FIRE CEMENT.

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SPECIAL PAINT FOR GAS-WORKS.

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VICTORIA PAINT WORKS,
MANCHESTER.
Te'egrams: "ENAMEL." National Telephone 1759.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
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CONTRACTS are undertaken by William EDGAR for FITTING UP HOUSES complete with the PENNY-IN-THE-SLOT INSTALLATIONS. Gas Companies or Corporations indemnified against loss through Accidents, &c. Thousands of Houses have been fitted up by me under this System. Estimates free.
BLENHEIM HOUSE, 23, Lower Mall, HAMMERSMITH.
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JOHN RILEY & SONS, Chemical Manu- facturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

COAL GAS TAR wanted.

State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers Sharpness Docks, GLOS.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
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GAS TAR wanted.

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Largest Practice and most Up-to-Date Works in Britain.
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So Simple!

Simple Simon met a pieman
Going to the Fair,
Said Simple Simon to the pieman:
"Let me taste your ware."

Said the pieman to Simple Simon:
"Show me first your penny;"
Said Simple Simon to the pieman:
"Indeed, I have not any."

SIMPLE SIMON lived before the days of Gas and the **"Eureka"** Cooker. We were first in the field, but we were too late for Simon. The loss was Simon's!

Simon was simple, but the **"Eureka"** is simpler still. With all his simplicity—and a **"Eureka"**—he could have baked his own pies, quite as good ones as the pieman's, and at half the money. He could have done it in less time than it took him to go to the Fair and beg them on the long-credit system from the historic pieman, who evidently preferred cultivating a cash trade only.

You can't get

COOKERS FOR NOTHING

any more than Simon could get pies at the same low rate, but if you have an attack of Simon's complaint—viz., the want of ready money—there is a cure for your ailment (provided it isn't chronic)—you can have a **"Eureka"** on hire. That is where you have the pull over Simon. With him it was "No pay, no pie," and the hire system would work rather awkwardly in the pie trade!

"We don't know what we want," said the Irishman, "but, be the powers, we mane to have it!" Simon was wiser than Paddy, after all, for he had wit enough to know what he wanted, and to ask for it. If you haven't a **"Eureka,"** it goes without saying that you want one; then ask for it, and have it at once.

The **"Eureka"** is the first in the market—first in time, and first in quality. It will do as much as any Cooker; do it better than many; and do it longer than most. It will make poor food palatable, and dear food delightful. It will broil without burning, roast without turning, fry without frizzling, and do the thousand and one needful things that only cooks and housewives know of, with little trouble, less cost, and no dirt or smell whatever.

Your Gas Company supplies The "EUREKA" for cash, or on hire. For rates see next page.

JOHN WRIGHT & CO.,
Essex Works, Aston,
BIRMINGHAM.

We shall be pleased to send you a quantity of LEAFLETS as above, upon hearing from you, with your Name and Address, &c., printed on.